Concept 1 The Cell as a System

1 Summary of Concept 1

Cells • They are the basic units, or building blocks, of life on Earth.

Cells function:

- Cells carry out all the functions that organisms need to live, such as:
  1 Growing 2 Repairing themselves 3 Reproducing
  4 Responding to the environment

Cells size:

- Most cells are very small, so you will need a microscope to see them.
  Examples: Plant cells - Animal cells - Bacteria cell
- Some cells are very large.
  Examples: An unfertilized bird's egg

NOTES:

- The unaided human eye can see objects that are about 0.1 millimeters (mm) long.
- Common plant or animal cells are between 0.005 and 0.1 mm long.
- Bacterial cells are smaller than plant or animal cells.

Cells number:

- Living organisms are classified according to the number of cells into:

1 **Unicellular organisms:**

They are organisms made up of **only one** cell. Ex. Bacteria

2 **Multicellular organisms:**

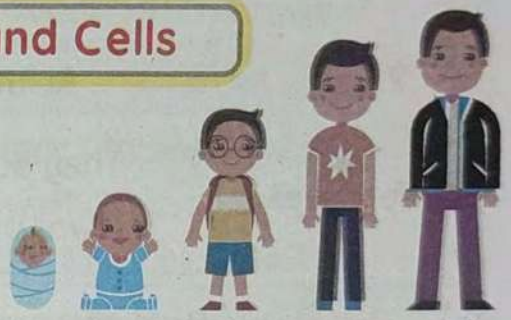
They are organisms that have **more than one** cell.

Ex. Complex organisms, such as humans, animals and plants.

Basic Needs of a Cell:

- The basic needs of a cell are similar to the needs of all organisms, such as:
  1. Oxygen gas and food to get energy
  2. Water
- Cells have a way of **taking in** the needed materials and using them to get energy, grow, and live.
- Cells have a way of **releasing** waste products.
- It controls (regulates) which substances can enter or leave the cell.
- **The cell membrane allows water to enter the cell.** G.R
  Because water is a basic need for the cell to live.
- **The cell membrane allows water to leave the cell.** G.R
  To maintain the proper water balance on both sides of the cell membrane.

Organism Growth and Cells



- Living organisms grow and reproduce by increasing the **number** of cells.
- All new cells come from existing cells.

NOTES:

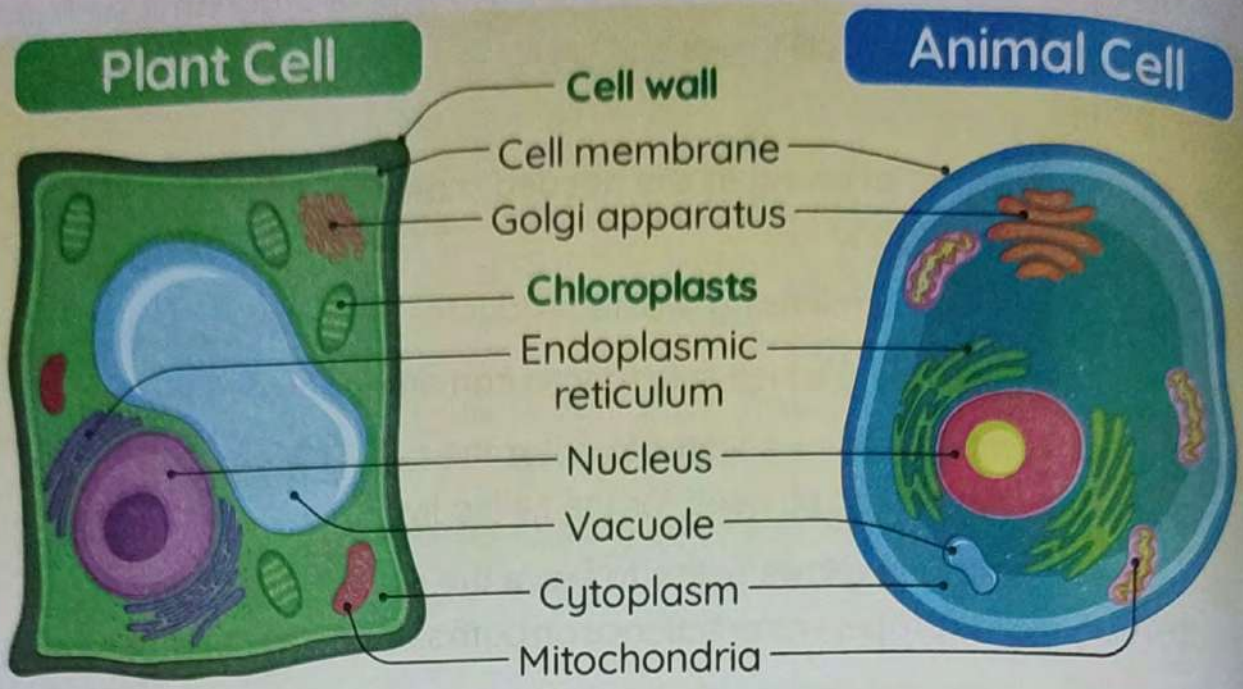
- The number of cells in living organisms varies.
- Humans have about 40 trillion cells.
- The body contains many different kinds of cells with different functions.
- Plants have a variety of cell types that perform photosynthesis or collect water and mineral nutrients.
- All cells consist of a cell membrane.
- Not all cells have a nucleus, such as red blood cells.

Blood Cells

Brain Cells

Muscle Cells

Structure of the Cell

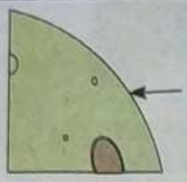
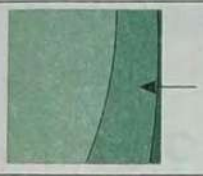


Comparison Between Plant and Animal Cells

P.O.C	Animal Cells	Plant Cells
Differences	They don't have a **cell wall** or **chloroplast**	They have a **cell wall** and a **chloroplast**
Similarities	Both of them have common organelles, such as: 1 Cell membrane 2 Cytoplasm 3 Nucleus 4 Mitochondria 5 Endoplasmic reticulum 6 Golgi apparatus 7 Vacuole	

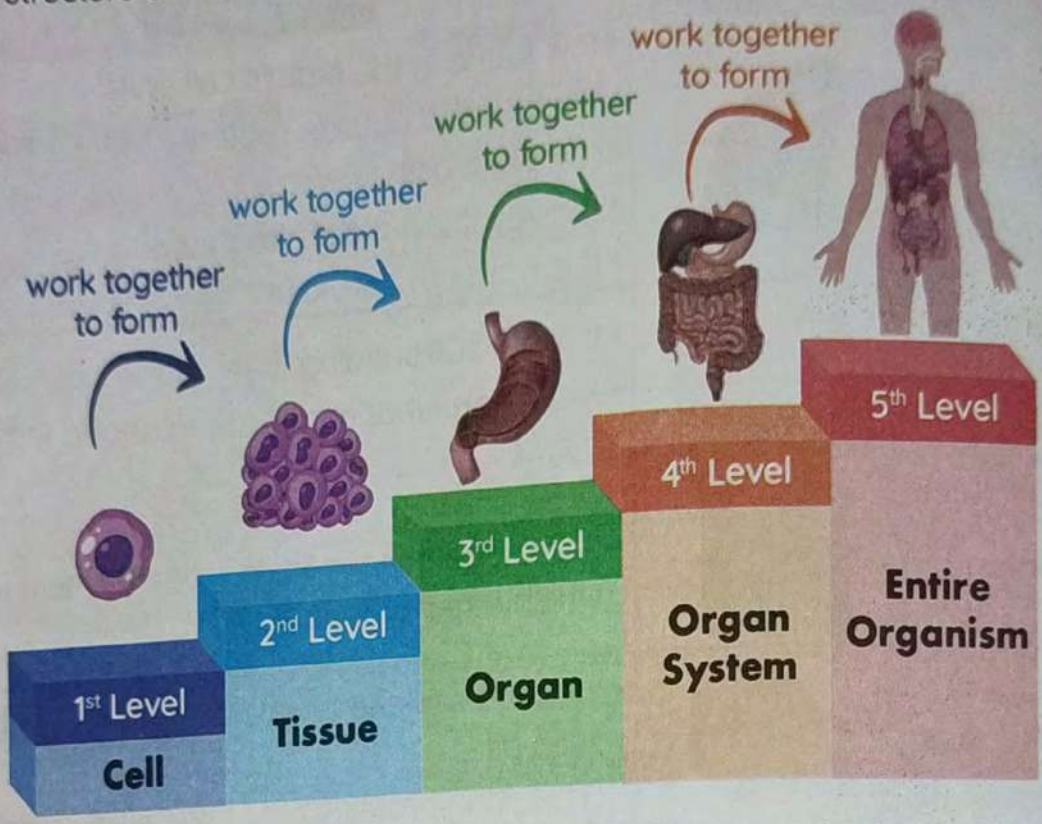
- Both plant and animal cells have common organelles to **control**, **organize**, and **maintain** the cell.
- Plants can make their own food because they have **chloroplasts**.
- Animals can't make their own food because they don't have chloroplasts.
- Animals do not take on the rigid structures that plants do because they don't have cell walls.
- Animals have other ways of keeping their shape.
  - Some animals have **bones**.
  - Insects have an **exoskeleton** (a hard, shell-like covering).

The Function of Each Organelle Inside the Cell

Organelle	Illustration	Function
Cell Wall		• It is found in the plant's cell only. • It's the rigid outside material that surrounds the plant cells. • It gives them a **definite** shape. • It is made of **cellulose**.
Plasma (Cell) Membrane		• It is the surrounding layer of the cell. • It controls what materials enter and leave the cell.
Cytoplasm		• It is the **gelatinous liquid** inside the cells in which other **organelles** float.
Cell Nucleus		• It controls all the functions inside the cell, such as: [1] Making proteins [2] Cell division
Mitochondria		• They convert **sugar** into **energy** for the cell. • They are the **powerhouses** of the cell. • **Cellular respiration** takes place in it.
Vacuole		• They are **saclike** structures used for the storage of nutrients, water, and waste. • In plant cells, large vacuoles contain water.
Chloroplast		• It is found in the plant's cell only. • It contains chlorophyll and carries out the **photosynthesis process**.
Endoplasmic Reticulum		• It helps in **assembling** and **transporting** proteins.
Golgi Apparatus		[1] It helps in **preparing**, **packaging** and **transporting** materials within the cell. [2] It helps in **transporting** materials out the cell.

Levels of Biological Organization

» The structure of most multicellular organisms is organized into **five levels**:



» Each level plays a specific role related to that organism's structure and function.

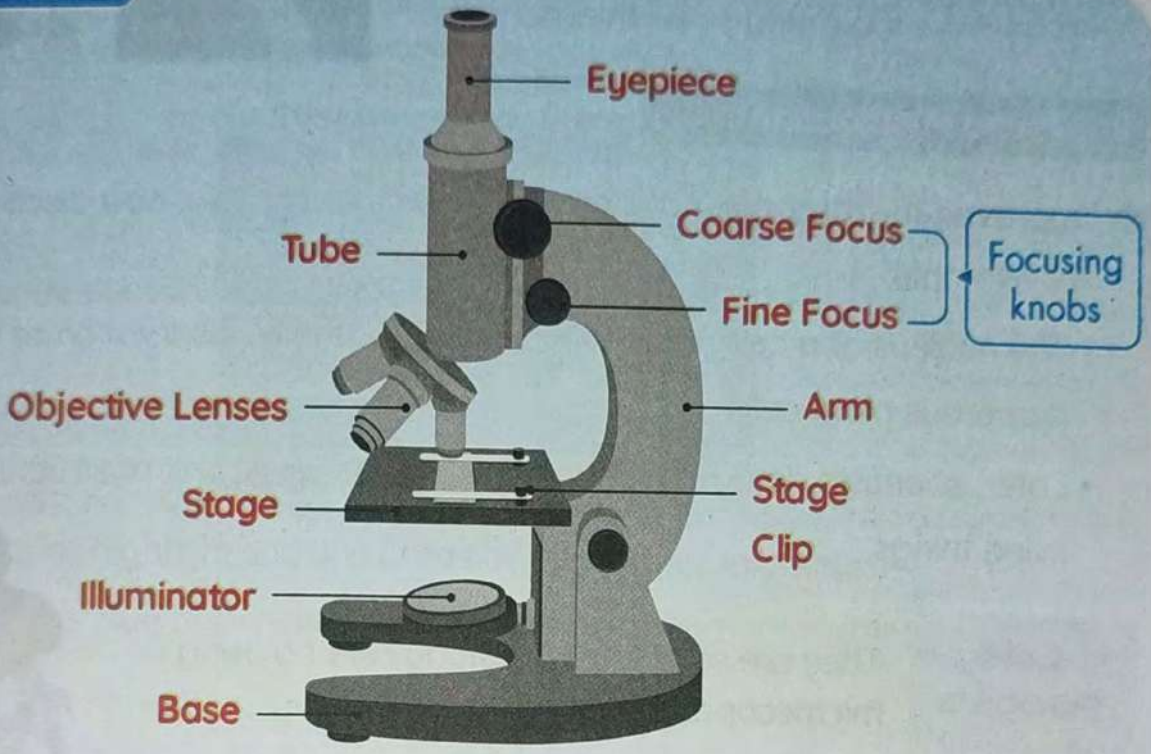
Level	Definition	Examples
Cell	The basic (smallest) unit of life.	Stomach cells
Tissue	A group of similar cells that share a common origin and perform the same function.	Stomach tissues
Organ	A group of tissues involved in performing a specific function.	Stomach
System	A group of organs that perform a specific function.	Digestive system
Entire Organism	A group of systems that work together.	Human

Compound Microscope

Importance:

- It magnifies cells that can't be seen by the unaided eye.

Structure:



Steps of using the microscope:

1. Place the microscope slide on the stage and secure it with the stage clips.
2. Pick up the lowest-power objective lens.
3. Look at the slide through the eyepiece while adjusting the focusing knobs to get more clear view of the specimen.
4. Clean up the slide and store the microscope safely when you are finished.

History of The Microscope:

- Robert Hooke was the first person to use the word "cell".
- He used the newly invented microscope to observe too many small things.

Improved Microscope:

- **Improved microscopes** have allowed scientists to make **new discoveries**, for example:
  - The nucleus of a cell was discovered through the observation of numerous plant cells.
  - Later, scientists determined that cells are the basic unit of structure in living things.

Cells biologists They are scientists who study **cells** by using **microscopes** in **laboratories**.

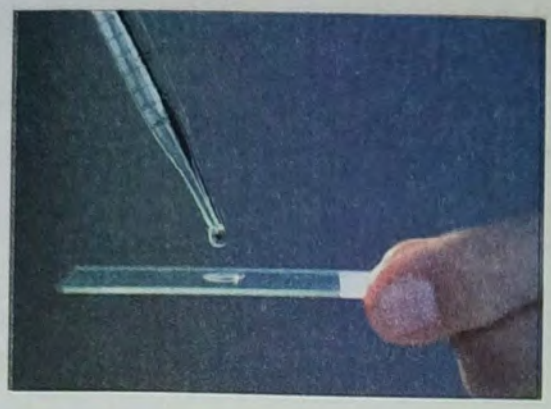
The roles of cell biologists:

1. They study how cells function in living organisms.
2. They conduct experiments and investigate how cells respond to different variables.
3. They analyze data and present their findings to other researchers.
4. **Some cell biologists can work with doctors.** G. R
   To watch how cells can work to repair body parts or how cells respond to medications.
5. **Some cell biologists work in agriculture.** G. R
   To study how plant cells respond to different environmental factors.

Staining Cells

» Stains (dyes) are used to make the cell's structures more visible under a microscope. G.R

- Because cells are usually clear and colorless and it is hard to see their structures, even under a microscope.



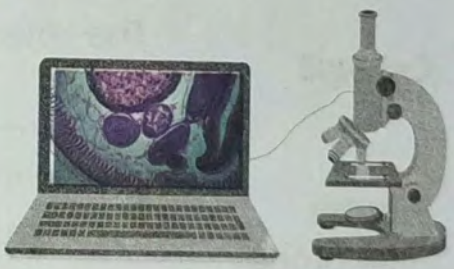
» Some stains highlight specific areas of the cell, for example:

- Methylene blue dye makes one part of the cells more visible.

Cells in 3D

» Scientists have built a microscope that shows a live cell in 3D.

» This means that scientists can see the top, sides, and layers of a cell.



The importance of seeing cells in 3D:

1. This helps biologists learn more about cell parts and how cells divide.
2. This helps doctors who treat cancer offer more help to patients.

How does the 3D microscope work?

1. These new 3D microscopes take pictures of the cell in layers.
2. A computer puts the layers together.
3. The colors are then added to the image.

2 Definitions of Concept 1

Cell	It is the basic unit (building block) of a living organism's body.
Multicellular organisms	They are organisms whose bodies are composed of more than one cell.
Unicellular organisms	They are organisms whose bodies are composed of only one cell.
Organelle	It is a part inside the cell that has a specific function.
Tissue	It is a group of identical cells that perform the same function.
Organ	It is a group of tissues that work together to perform a specific function.
System	It is a group of organs that perform a specific function.
Cell wall	The outer layer of the plant cell that supports and keeps its shape.
Plasma membrane	• The outer lining of the cell that surrounds the cytoplasm. • The structure that controls the substances that enter or leave the cell.
Selective permeability	A feature through which the cell membrane determines which substances will pass through.
Cytoplasm	• A gelatenious liquid inside the cell.
Nucleus	The control center of the cell that is responsible for all the cell's activities.
Mitochondria	They are the powerhouses of the cell that release energy from food during cellular respiration.

Cellular respiration	A vital process through which the cell uses oxygen gas to get energy from food.
Vacuoles	They are saclike structures that store nutrients, water, and waste inside the cell.
Chloroplasts	Organelles are found in the plant cell that produce sugar from sunlight in the photosynthesis process.
Chlorophyll pigment	A green pigment found in chloroplasts that absorbs sunlight needed for the photosynthesis process.
Endoplasmic reticulum	An organelle that is responsible for the assembly and transport of proteins in the cell.
Golgi apparatus	An organelle that packages and transports materials inside the cell and outside it.
Cell biologist	The scientist who studies cell function.
Methylene blue	A stain (dye) is used to see a specific part of the cell under the microscope.
3D microscope	A type of microscope that allows scientists to see the top, sides, and layers of the cell. (3 dimensions of the cell)

3 Give Reasons for... Concept 1

1 The cell provides the structure of the living organism's body.
- Because cells are the building blocks of all living organisms' bodies.

2 A plant is considered a multicellular organism.
- Because its body is composed of more than one cell.

3 Bacteria are considered unicellular organisms.
- Because its body consists of only one cell.

4 You can see a bird's unfertilized egg, but you can't see your skin cells withou a microscope.
- Because the unfertilized egg is a very large cell, but the skin cell is very smal

5 The cell membrane is very important for the cell.
- Because it allows the substances to pass in and out of the cell according t its needs.

6 The cells of the same living organisms are different in shape and size.
- Because they have different functions.

7 The cell membrane has an important role in the cell.
- Because it controls the substances that pass in or out of the cell.

8 The cell membrane has a selective permeability property.
- To allow the needed substances to enter the cell and the waste materia to leave it.

9 The nucleus is the control center of the cell.
- Because it directs all the activities of the cell, such as cell division an producing protein.

10 The plant cell has a definite shape.
- Because it is surrounded by a cell wall from the outside.

11 Mitochondria have an important role in the cell.
- Because they power the cell with energy.

12 Animals can't make their own food.
- Because animal cells don't have chloroplasts.

13 Animals can keep their shapes.
- Because they have bones or exoskeletons, such as in insects.

14 The vacuole of the plant cell is larger than that of the animal cell.
- Because it stores a large amount of water.

15 Mitochondria are considered the powerhouse of the cell.
- Because they power the cell with energy.

16 The Golgi apparatus acts as the post office of a city.
- Because it packages and transports all materials inside the cell and outside it.

17 The chloroplasts are the food factories of the cell.
- Because they make sugar from sunlight through the photosynthesis process.

18 The endoplasmic reticulum has an important role in the cell.
- Because it assembles and transports proteins in the cell.

19 It is hard to see the cell structures even under a microscope without dye.
- Because the cell is colorless and clear.

20 Cell biologists have a great role in the fields of medicine and agriculture.
- They help doctors figure out the response of a cell to the medicine, and they study the effect of environmental factors on the plant.

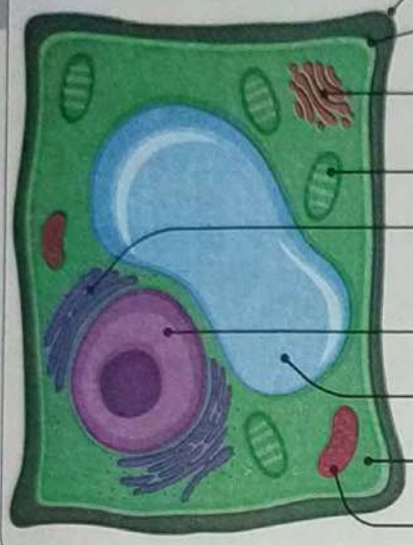
21 Cell biologists help doctors treat cancer.
- Because they study the cell parts and how the cell divides.

4 What Happens If...? Concept 1

1. The cell can't meet its basic needs?
   - It can't do the functions that keep organisms alive.
2. The cell membrane in an animal cell is absent?
   - The cell can't get the needed substances and can't get rid of waste ones.
3. Too much water enters the cell?
   - The cell will swell and burst.
4. The cell wall in the plant cell is absent?
   - It will have an indefinite shape.
5. Mitochondria in an animal cell are absent?
   - The cell can't get energy to do all its functions.
6. The cell couldn't carry out the cellular respiration?
   - The cell can't get energy to perform its activities.
7. Chloroplasts in a plant cell are damaged or functioning improperly?
   - The plant can't make its own food.
8. The endoplasmic reticulum is absent from the cell?
   - The cell can't assemble or transport protein.
9. The Golgi apparatus is absent from the cell?
   - Materials can't be packaged or transported inside or outside the cell.
10. The plant has a small vacuole?
    - It can't store a large amount of water to perform its functions.
11. You look at a specimen of a cheek dyed with methylene blue under a microscope?
    - I can see the nucleus.

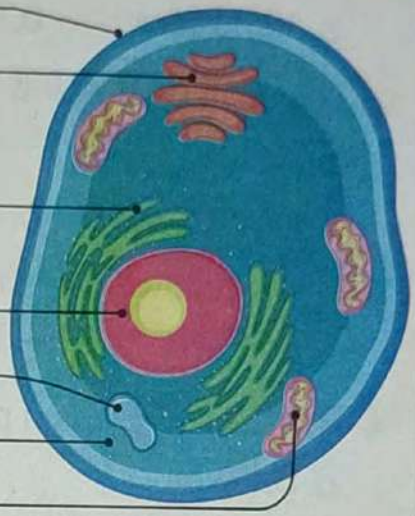
5 Important Drawings Concept 1

Plant Cell

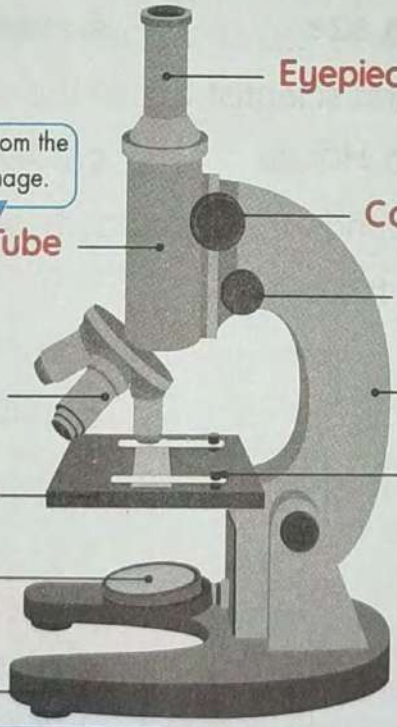


Cell wall
Cell membrane
Golgi apparatus
Chloroplasts
Endoplasmic reticulum
Nucleus
Vacuole
Cytoplasm
Mitochondria

Animal Cell



Compound Microscope



Eyepiece — We look at the specimen through it.

Collecting the light from the sample for clearer image.
Tube

Coarse Focus
Fine Focus
Adjusting the clear focus on the specimen.

Changing the magnifying power by changing the objective lens.
Objective Lenses

Arm — Holding and moving the microscope.

The slide is placed on it.
Stage

Stage Clip — Securing the slide on the stage.

Illuminator
Providing a light source to see the specimen.

Base
Holding the microscope up.

Microscope parts functions are for illustration.

6 Revision on Concept 1

1 Choose the correct answer:

1. The human body is composed of ..... cells.
   a. 40 hundred b. 40 thousand c. 40 million d. 40 trillion
2. The ..... is the smallest building unit and structure of a living organism's body.
   a. tissue b. cell c. organ d. system
3. All the following are multicellular organisms, except ..... .
   a. humans b. bacteria c. plants d. animals
4. The ..... has a property called selective permeability.
   a. cell wall b. nucleus
   c. cytoplasm d. plasma membrane
5. A living organism grows and reproduces by increasing the ..... of its body cells.
   a. number b. size c. volume d. length
6. ..... was the first scientist to use the word "cell".
   b. Newton b. Hooke c. Edison d. Einstein
7. The ..... surrounds the cytoplasm and controls the substance that enter or leave the cell.
   a. cell wall b. nucleus
   c. cell membrane d. mitochondrion
8. The ..... is a jelly-like substance where the cell organelles ar floating.
   a. cell wall b. nucleus
   c. cytoplasm d. plasma membrane
9. The ..... is/ are responsible for cellular respiration.
   a. cell wall b. nucleus
   c. plasma membrane d. mitochondria

10 Which of the following organelles is located in the plant cell only?

a. Chloroplasts b. Cell wall

c. Nucleus d. a and b

11 The ..... surrounds the plant cell from outside and gives it a definite shape.

a. nucleus b. cell wall

c. cytoplasm d. cell membrane

12 All the following can be stored in the cell vacuole, except ..... .

a. wastes b. blood c. water d. nutrients

13 ..... are unique structures that exist only in the plant cell.

a. Mitochondria b. Nuclei c. Vacuoles d. Chloroplasts

14 The ..... release(s) energy from food to power the cell.

a. mitochondria b. cell wall

c. nucleus d. cell membrane

15 If the cell wall is the gate of the plant cell, so the ..... is considered its battery.

a. mitochondria b. cell wall

c. nucleus d. cell membrane

16 ..... packages and transports proteins and other materials within the cell.

a. Golgi apparatus b. The nucleus

c. The cell wall d. The cell membrane

17 If the diameter of an animal cell is 10 microns, so the diameter of its nucleus may be ..... .

a. 10 microns b. 2 microns c. 10 mm d. 2 cm

18 All the following are from the cell features, except it is usually ..... .

a. very small b. colorless c. clear d. colorful

19 A plant and fish are common in having ..... .

a. cells of the same shape b. cells of the same size

c. cells d. no cells

20 The ..... transports proteins within the cell.

a. golgi apparatus b. mitochondria

c. cell wall d. nucleus

2 Put (✓) or (✗):

1. You can see a bird's unfertilized egg without a microscope. ( )
2. A cell releases oxygen and food and intakes in waste materials. ( )
3. A bacterial cell is between 0.1 and 0.005 mm long. ( )
4. The cell will burst when too much water keeps entering it. ( )
5. All the bodies of living organisms have more than one cell. ( )
6. The nucleus is discovered during observation of some animal cells. ( )
7. A leaf cell and a red blood cell can exist in the same organism. ( )
8. Both the heart and stomach are considered tissues. ( )
9. The nucleus and cell membrane float in the cytoplasm. ( )
10. All cells have a cell membrane. ( )
11. Mitochondria are the part that is responsible for the cellular respiration ( )
12. The endoplasmic reticulum is the post office that packages proteins in the cell. ( )
13. Chloroplasts have a blue pigment called methylene blue. ( )
14. The plant cell has a larger vacuole than that of the animal cell. ( )
15. The 2D microscopes take pictures of the cell in layers. ( )
16. Cancer is caused by the slow division of a cell. ( )

3 Write the scientific term:

1. They are the building blocks of life on Earth.
2. They are living organisms, and their bodies consist of more than one cell.
3. A device can be used to magnify cells, so we can see them.
4. A type of water added to the samples in microscopes.
5. It is a group of tissues that perform a specific function
6. It is a group of organs that perform a specific function.
7. The structure that controls cell division and other cell activities.
8. A liquid found in the cell that holds its organelles.
9. They are the powerhouses of energy in the cell.

10 The process through which the cell uses oxygen gas to get chemical energy from the food.

11 They are saclike organelles that store nutrients, water, and wastes.

12 Organelles in the plant cell carry out the photosynthesis process.

13 The scientist who studies cell function.

14 The stain is used to see a specific part of the cell under the microscope.

15 A disease caused by the abnormal division of a cell too quickly.

4 Complete the following sentences using the words between the brackets:

A

(Bones - Chloroplasts - pigment chlorophyll - exoskeleton - mitochondria - cell membrane - cell wall)

1 _____ release energy from the food, but _____ produce food from sunlight.

2 _____ support the fish body shape, while a/an _____ supports that of insects.

3 In photosynthesis process, _____ found in chloroplasts absorb(s) sunlight.

4 The outermost layer of the plant cell is the _____ while it is _____ in the animal cell.

B

(Golgi apparatus - sugar - 3D microscope - Nucleus - energy - endoplasmic reticulum)

1 _____ transport(s) proteins produced by _____ through the cell.

2 Mitochondria convert _____ into _____ that is needed for the cell activities.

3 _____ is used to see all layers of the cell.

4 _____ is considered the brain of the cell that controls all its activities.

5 Cross out the odd word:

1. Cell membrane - Cell wall - Nucleus - Cytoplasm
2. Blood cell - Stomach - Lung - Liver
3. Plants - Humans - Bacteria - Animals

6 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Mitochondria	a. is the packaging factory of the cell.
2 Golgi apparatus	b. is the food factory of the cell.
3 Chloroplast	c. resembles the construction worker of a city.
4 Vacuole	d. are the powerhouses of the cell.
5 Endoplasmic reticulum	e. Is considered the storage facility of the cell.

1 ..... 2 ..... 3 ..... 4 ..... 5 .....

Column (A)	Column (B)
1 Nucleus	a. are responsible for the cellular respiration.
2 Cell membrane	b. controls all cell activities.
3 Cell wall	c. supports the plant cell from outside.
4 Mitochondria	d. controls the passing of substances into or out the cell.

1 ..... 2 ..... 3 ..... 4 .....

7 Study the following figures:

A

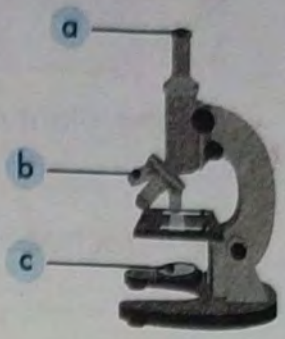
1 The opposite figure represents .....

2 Write the following labels:

a. .....

b. .....

c. .....



B

1 The opposite figure represents .....

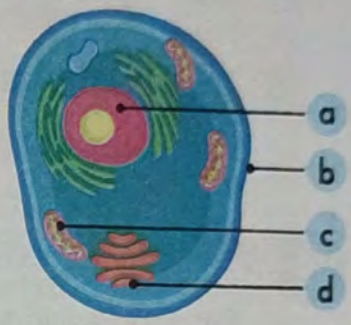
2 Write the following labels:

a. .....

b. .....

c. .....

d. .....



3 Mention the functions of the parts a and c.

.....

.....

C

1 The opposite figure represents .....

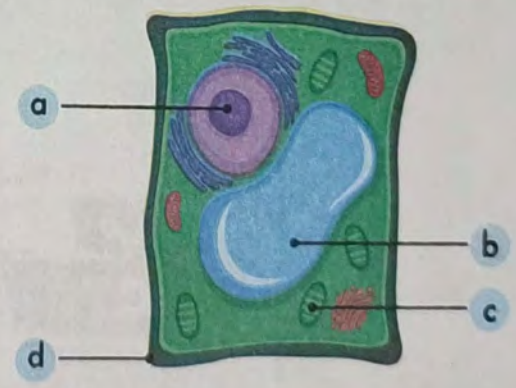
2 Write the following labels:

a. .....

b. .....

c. .....

d. .....



3 Mention the function of part c.

.....

.....

8 Give reasons for:

1 The nucleus is the control center of the cell.

2 The liver is considered as an organ.

3 The plant cell has a definite shape, but the animal cell doesn't.

4 Mitochondria have an important role in the cell.

5 Animals can't make their own food.

6 The chloroplasts are the food factories of the cell.

9 What happens if:

1 Mitochondria stopped converting sugar into energy?

2 The Golgi apparatus is absent from the cell?

3 Too much water enters the cell?

Concept 2 The Body as a System

1 Summary of Concept 2

The Body as a System

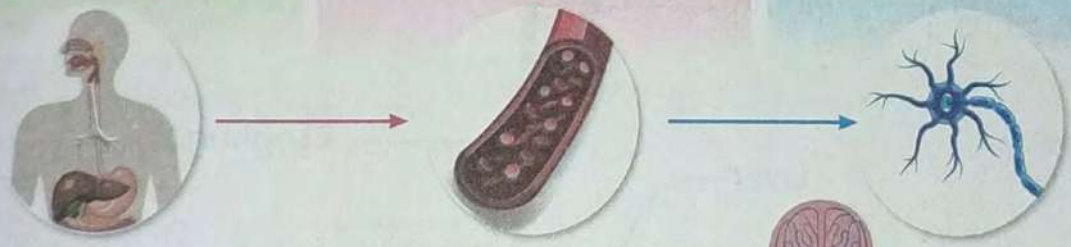
- Different systems in the body work to do different jobs.
- Each individual body system works with the other body systems.

The Interaction Between Systems

The nervous system depends on other body systems functions:

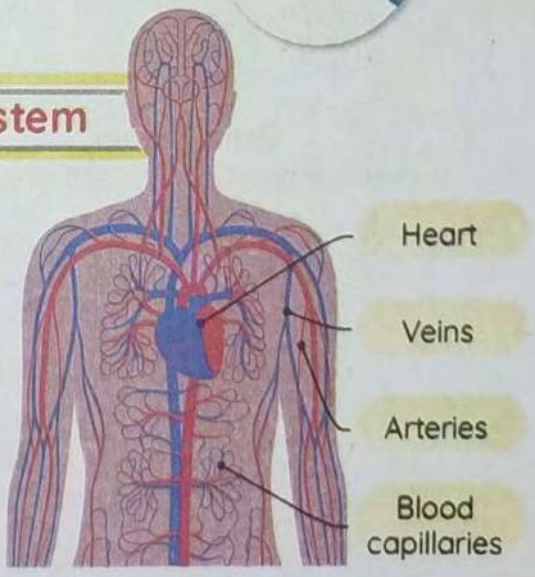
For example, nerve cells need nutrients

The Digestive System	The Circulatory System	The Nervous System
The nutrients enter the body as food that is broken down by the digestive system.	The nutrients are transported to nerve cells by the circulatory system.	The nerve cells use nutrients to perform their function.



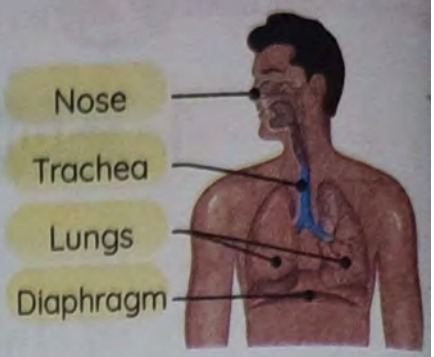
Circulatory System

- The circulatory system transports blood, gases, hormones, and nutrients throughout the body.
- The heart muscle pumps the blood throughout the body.
- Blood vessels allow blood to flow through the body.



Respiratory System

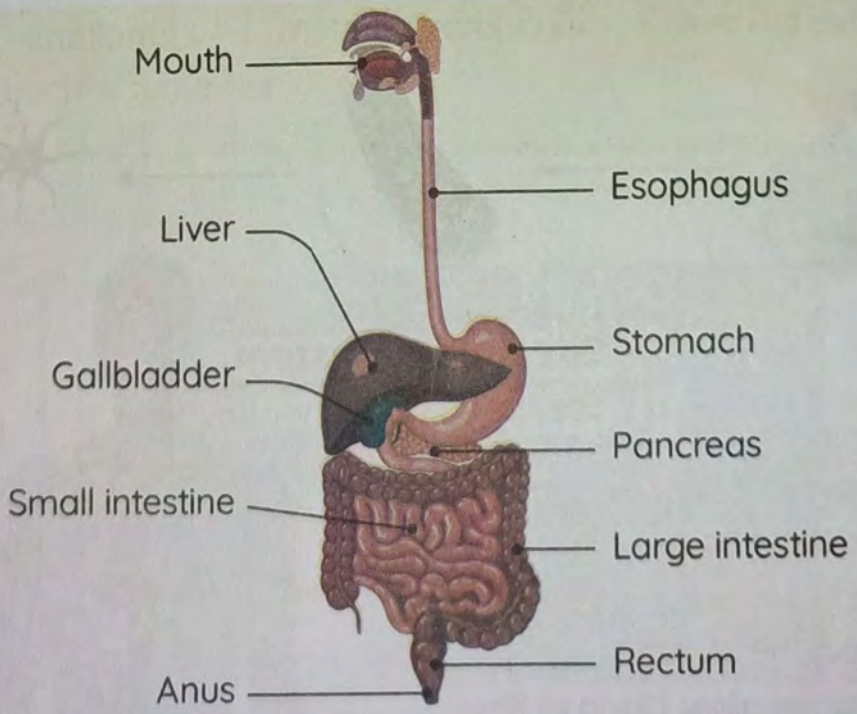
Lungs	• Lungs **take in oxygen gas** and **remove carbon dioxide gas** as part of respiration and circulation processes.
Diaphragm	• The diaphragm is a muscle that helps with respiration, as follow, • When diaphragm muscle **contracts**, the lungs take in air. • When the diaphragm muscle **relaxes**, air is pushed out of the lungs
Bloodstream	• It transports oxygen from lungs to all your body parts.



Digestive System

» It breaks down **food** into **nutrients,** which the body can use for energy an growth.

The Structure of the Digestive System



1 The Beginning of Digestion

» Digestion begins in the mouth with the first bite you have..

Jaw muscles	• They create movement to help your teeth chew food. • Chewing breaks up the food and increases its surface area.
Saliva	• It softens the food by adding **(enzymes)** that get mixed with it to start the chemical breakdown.

» Then the muscles of the esophagus push the food down to the stomach.

2 Breaking Down Food

(a) In the stomach:

• The continuous churning and the secreting of the stomach's **digestive fluids (acid and enzymes)** further break down the food.

(b) In the small intestine:

• **The pancreas** and **gallbladder** secrete additional enzymes that assist in the chemical breakdown of food.

• Absorption of nutrients takes place in the **small intestine**.

• **Nutrients** are carried away to the blood through the blood capillaries in the wall of the small intestine.

3 Transporting Nutrients

» Nutrients are transported to different organs via the **circulatory system**.

1 Some nutrients are **used immediately**.

2 The rest of the nutrients are **stored**.

• **For example,**

a. Some nutrients are stored as fat.

b. The liver and muscles can store **sugar glucose**.

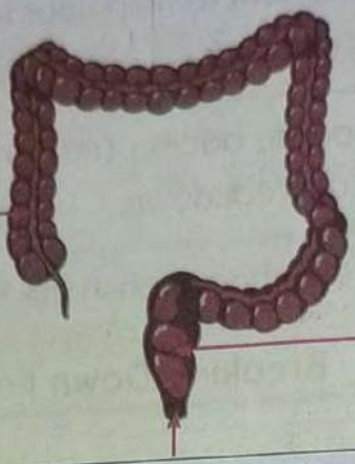
- They convert it into a special storage substance as an animal starch called **glycogen**.
- The liver and muscles can then release the glucose when it is needed.

4 Getting Rid of Waste

» Undigested (unabsorbed) food enters the large intestine as a **soupy mixture**.

1 Large intestine

- It reabsorbs most of the water, changing a liquid into a solid wastes called feces (stool).



2 Rectum

- It is the last section of the large intestine.
- **Function:** It stores feces until they are expelled.

3 Anus

- It is a muscular opening at the end of the rectum.
- **Function:** Waste materials are eliminated from the body through it.

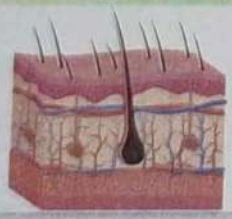
Excretory System

» It collects waste materials produced by cells, then removes them from t body.

The systems that involved in excretion are

Skin

When you sweat, waste leaves the body through the pores in your skin.

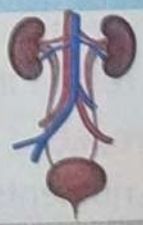


Respiratory System

When you exhale, carbon dioxide leaves your body as waste.

Urinary System

The urinary system removes waste products from your blood.



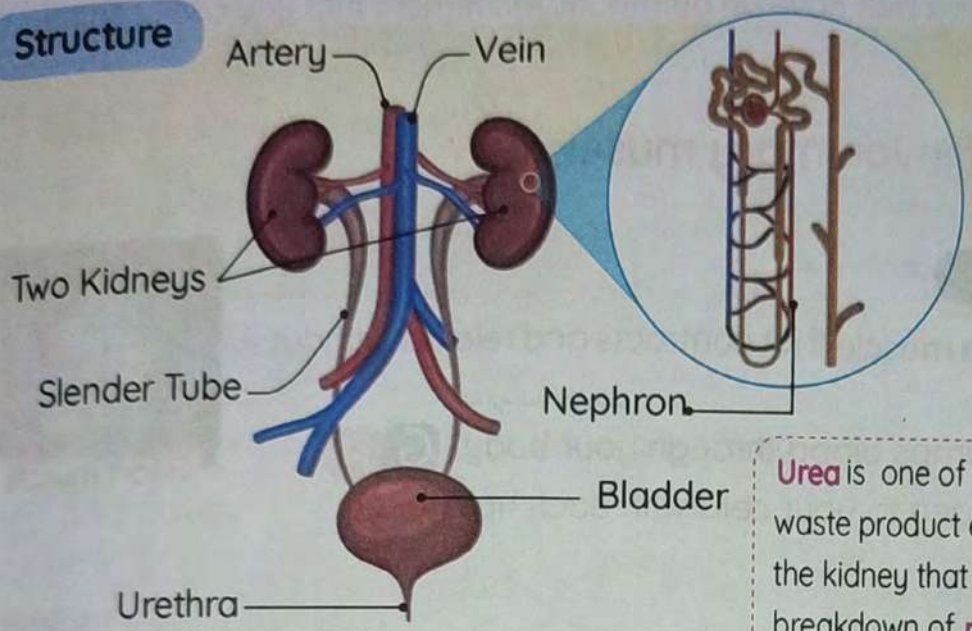
Excretion ● It is the process of eliminating waste from the human body.

Urinary System

Importance

- It removes harmful wastes from your blood.

Structure



Nephrons: They are microscopic filters that remove harmful substances from the body.

Urea is one of the most important waste product eliminated by the kidney that comes from the breakdown of **protein**.

How the Urinary System Works?

1. Large artery brings blood into each kidney.

2. **Inside the kidney,**
   - Tiny blood vessels branch off and pass through part of each **nephron**.
   - Nephrons filter the blood and remove harmful substances.

3. After filtering is complete, **urea**, **other waste products**, and **water** become **urine**.

4. Urine leaves each kidney through a slender tube and collects in the bladder.

5. The bladder empties through another tube called the urethra.

Urination ● It is the process of expelling urine from the body.

» Muscles must **contract** and **relax** to allow for movement.

1 Involuntary Muscles

They are muscles that have an automatic movement that you can't control.

• Examples of involuntary muscles:

1 Heart Muscle:

Heart muscle

» The heart is **a muscle** that contracts and relaxes without any rest.

» The heart pumps blood through your body. G.R

To send oxygen to your cells with each heartbeat.

2 Eyelid Muscle:

Eyelid muscle

» Eyelid muscle contracts when you close your eyelid.

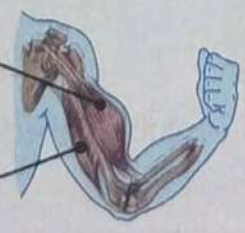
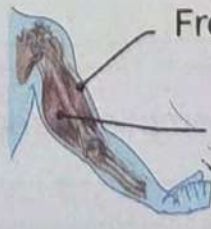
» You blink about 10 times a minute without even thinking about it.

2 Voluntary Muscles

They are the skeletal muscles that you can control their movement.

1 Arm Muscles:

» Bending your elbow takes the action of two different voluntary muscles.

When you bend your arm	When you straighten your arm
Front muscle (contract) Back muscle (relax) 	 Front muscle (relax) Back muscle (contract)

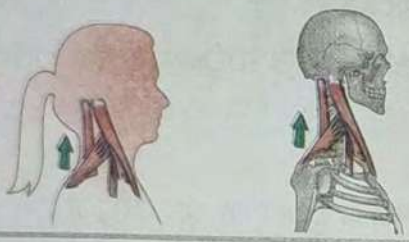
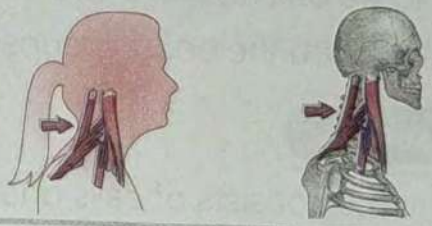
2 Forearm Muscles:

» When you turn your hand over, it takes the action of two important voluntary muscles in your forearm.

When you palm facing up,	When you palm facing down,
One of your forearm muscles contracts. 	 Two other muscles contract.

3 Neck Muscles:

» Two important neck muscles work when you move your head up and down.

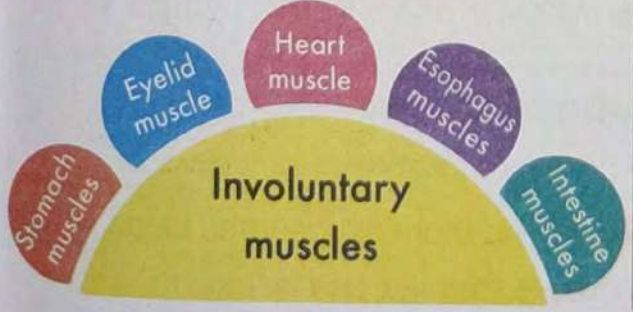
When you lift your head up, one of your neck muscles contracts.	When you pull your head down, the other muscle contracts.
	

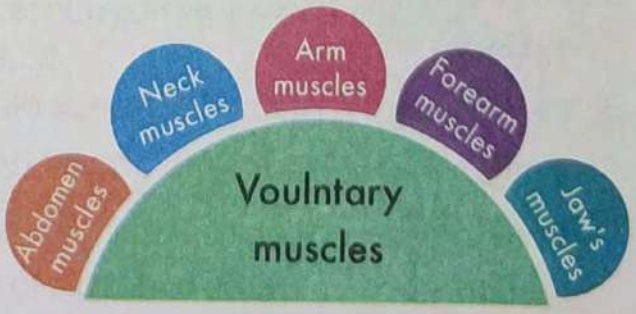
4 Abdomen Muscles:

» On each side of your body, you have two important abdominal muscles (abdominals).

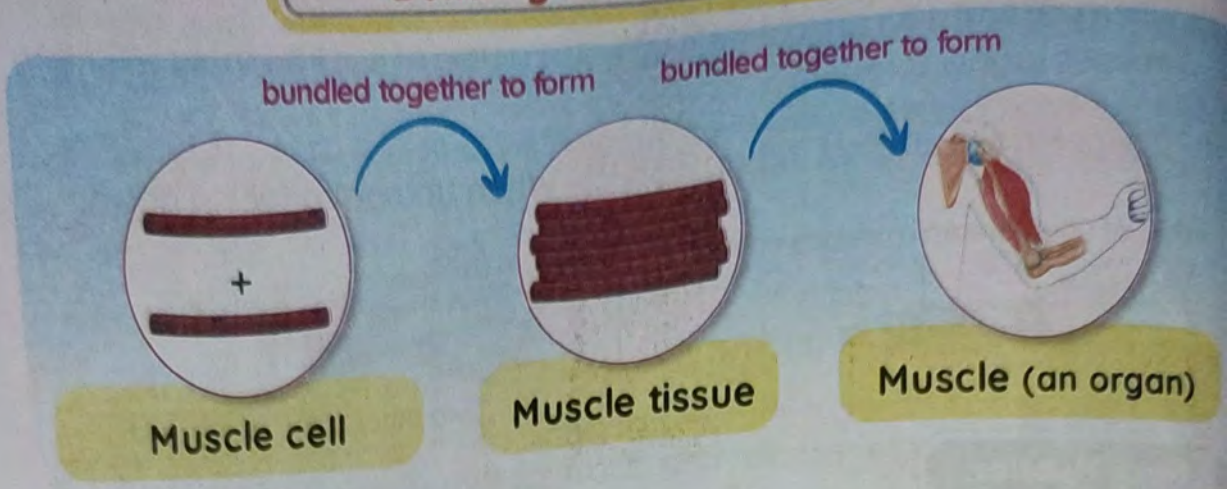
» **When you twist your body to one side,**

- The two muscles on that side **contract** together.
- The two muscles on the other side **relax** together.





Building Living Systems



1 Cells:

- Cells have a variety of **shapes** and **sizes** to perform specific functions fo example.
- Muscle cells need to be shaped like long fibers. G.R
  - To allow the movement.
  - To be able to store and use energy quickly.
- All around the body, groups of similar cells work together to form tissue

2 Tissues:

- A tissue consists of cells and is considered a part of an organ.

3 Organs:

- **Musculoskeletal system:** It is the system that consists of **bones**, **muscles**, **ligaments**, **tendons**, and **cartilages**.

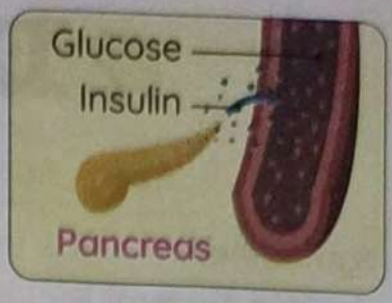
During the fight-or-flight response:

Many body systems work together to help the body react to danger.

1 **Endocrine system**	• It releases hormones to initiate the fight-or-flight reaction.
2 **Circulatory system**	• The heart pumps blood quickly around the body. • Heart rate and blood pressure increase.
3 **Respiratory system**	• It begins working harder to send more oxygenated blood to th muscles and brain to increase **stamina** and **reflexes**.

Pancreas:

It's an organ that produces the right amount of insulin to regulate the amount of sugar in your blood.



Hormone Insulin:

It's a hormone that moves sugar from the blood into the cells.

People with diabetes:

» Diabetes is one of the most well-known **disorders** of the endocrine system.

The pancreas is not working correctly. **So** Their bodies cannot make insulin or cannot use it. **So** Sugar stays in the blood and causes many problems.

Treatment of diabetes:

Many people with diabetes must give themselves regular shots of insulin.

Insulin pump — It's a device that is attached to the body to regulate blood sugar levels with automatic insulin injections.

Technology and diabetes:

Researchers are now working to develop an **artificial pancreas** as an internal organ instead of an external pump, so that it could deliver insulin as needed.

2 Definitions on Concept 2

Sympathetic nervous system	It is the system that stimulates the adrenal glands to make body organs respond to a stressful situation.
Muscle	A bundle of long fibers that is able to contract to allow body movement.
Skeletal muscles	Muscles attached to bones that cause the bones to move.
Musculoskeletal system	It is a system that consists of bones, muscles, tendons, ligaments, and cartilage.
Involuntary muscles	They are the muscles that have an automatic movement that you can't control.
Voluntary muscles.	They are skeletal muscles that you can control their movement.
Endocrine System	A system that contains glands that release hormones to help the human body prepare to react.
Glands	They are organs that secrete hormones inside the blood.
Circulatory system	It is the system that is responsible for the transportation of gases, nutrients, and hormones through the body.
Respiratory system	It is the system that responsible for taking in oxygen and getting rid of carbon dioxide gas through the respiration process.
Lungs	They are the most important organs of the respiratory system because they take in oxygen gas and expel carbon dioxide.
Diaphragm	A large muscle that helps in the respiration process.

Digestion process	The process of breaking down food into molecules that the body can use for energy and growth.
Digestive system	The system that breaks down food into nutrients that the body uses to get energy.
Saliva	It is a liquid enzyme produced in the mouth that softens and breaks down food.
Enzymes	They are chemicals stimulated by the endocrine system to help in food digestion.
Esophagus	It is a muscular tube that pushes food down to the stomach.
Colon	It is a part of the large intestine that receives undigested food from the small intestine.
Feces (stool)	They are solid wastes formed after absorbing water from undigested food in the large intestine.
Rectum	It is the last section of the large intestine where the stool is stored.
Anus	It is a muscular opening at the end of the rectum.
The excretory system	The systems that eliminate the wastes from the body.
Excretion	It is the process of eliminating wastes from the human body.
Urinary system	It is the system that filters blood from dissolved waste materials in the form of urine.
Kidneys	They are the most important organs of the urinary system because they filter blood from wastes.
Nephrons	They are microscopic filters inside the kidneys to filter the blood from wastes.
Urination	It is the process of expelling urine outside the body.
Urine	It is a waste product produced from kidneys and it contains urea, water and other wastes.

Urea	It is a waste product that comes from the breakdown of proteins, and it is eliminated by the kidneys.
Bladder	It stores urine till it is eliminated from the body.
Pancreas	An organ that produces the right amount of insulin hormone to regulate the amount of sugar in your blood.
Insulin	A hormone produced by the pancreas that regulates the amount of sugar in the blood.
Diabetes	A disease resulted from the disorder of the body to make or use insulin.
Insulin pump	A device that is attached to the body to regulate blood sugar levels.

A Functions of some body systems:

System	Function
Sympathetic nervous system	• It stimulates the adrenal glands to make body organs respond to a stressful situation.
Musculoskeletal system	• It is responsible for the movement of the body through the contraction of muscles.
Endocrine system	• It activates the glands to produce hormones to face a stressful situation.
Nervous system	• The nervous system directly controls various organs of the body.
Digestive system	• It breaks down food into simpler nutrients to supply the body with energy.
Circulatory system	• It delivers gases, nutrients, hormones and wastes throug the body.

Respiratory system	• It takes in oxygen from the air. • It expels carbon dioxide outside the body.
Excretory system	• It helps the body get rid of waste materials.
Urinary system	• It eliminates waste materials from the blood in the form of urine.

B Functions of some body organs:

Organ	Function
Glands	They produce hormones to let body organs face a danger situation.
Skeletal muscles	They allow the body to move.
Brain	It receives information from all body organs and sends response signals to them.
Lungs	They take in oxygen and get rid of carbon dioxide.
Diaphragm	• It contracts to let oxygen gas in the lungs. • It relaxes to expel carbon dioxide out of the body.
Heart	It's a muscle that contracts to pump blood to all the body parts.
Blood vessels	They allow blood to flow through the body.
Mouth	• The digestion process starts in it. • Chewing food into small pieces with the teeth and jaw's muscles.
Esophagus	It is a muscle that pushes food down to the stomach.

Stomach	It is a muscular organ that is responsible for breaking down food with the help of digestive enzymes.
Small intestine	• It completes food digestion with the help of gallbladder and pancreatic enzymes. • It is responsible for the absorption of nutrients.
Pancreas	• It produces digestive enzymes in the small intestine to break down food. • It produces insulin, which regulates the glucose level in the blood.
Gallbladder	It produces digestive enzymes in the small intestine to break down food.
Large intestine	They absorb water from undigested food to convert it int solid wastes (stool).
Rectum	It stores faces until they are expelled outside the body.
Anus	Stool is eliminated throughout the body.
Skin	It eliminates waste materials in the form of sweat through its pores.
Kidney	It filters the blood from wastes materials through nephron
Bladder	It stores urine till it is expeled outside the body through the urethra tube.
Liver	It stores glucose in the form of glycogen.

3 Give Reasons for... Concept 2

1. All body systems work together in harmony.
   - To keep the human body functioning well and alive.
2. The digestive system is important for the body's muscles and nerve cells.
   - As it provides them with nutrients to get energy.
3. The skeletal system can't do its job without muscles.
   - To move our bones, the muscles must contract and relax.
4. Your heart pumps more blood to your muscles when you run.
   - To deliver the nutrients and oxygen that are needed for muscle to run.
5. The digestive and circulatory systems depend on the nervous system to function.
   - Because the nervous system controls the muscles of the heart and stomach.
6. The cells of a multicellular organism are different in shape and size.
   - Because they have different functions.
7. Muscle cells need to be shaped like long fibers.
   - To allow movement and store and use energy quickly.
8. We can move our different body parts.
   - Due to contractions and relaxations of skeletal muscles that cause bones to move.
9. The heart is an involuntary muscle.
   - Because it contracts and relaxes without rest.
10. Arm muscles are voluntary muscles.
    - Because we can control their movements.
11. There are muscles around the eyeballs.
    - To help you move your eyes in different directions.
12. The endocrine system plays an important role in a dangerous situation.
    - Because it stimulates glands to release hormones to help the human body prepare to react to the danger.

13 When facing a danger, your blood pressure increases.
- Because the heart pushes more blood to the muscles, heart, and other vit organs to face the danger.

14 Various body systems work together under pressure.
- To help the body react to the danger.

15 The food must be broken down inside the human body.
- To convert it into nutrients that the body can use for getting energy and grow

16 In the case of fight, or flight muscles convert glycogen into glucose.
- To power the body's cells with energy.

17 Saliva has an important role in food digestion.
- Because it softens the food, it adds an enzyme to break down the food.

18 The excretory system keeps the body healthy.
- It collects and removes waste materials produced by cells.

19 The digestive system isn't involved in the excretion.
- Because excretion means waste materials must leave the body through a membra

20 Nephrons are considered microscopic filters.
- Because they filter the blood and remove harmful substances from it.

21 Blood cells and proteins can't pass through nephrons.
- Because blood cells and proteins are too large to pass through t nephrons.

22 Kidneys play a very important role in the urinary system.
- Because they constantly clean and filter your blood, up to 300 times a d

23 The pancreas must produce the right amount of insulin.
- To regulate the amount of sugar in the blood.

24 Researchers are now working to develop an artificial pancreas.
- To help people with diabetes, as it could deliver insulin as needed.

25 Salt can pass through the nephron's membrane.
- Because the salt particles are too small.

26 Kidneys are considered a filtration system for blood.
- Because it removes waste products from the blood.

27 Some people may get diabetes.
- Because their bodies can't make or use insulin properly.

4 What Happens If...? Concept 2

1. Your body muscles don't get nutrients?
   - The muscles won't be able to contract or move.
2. Your arm muscles contract?
   - The arm will move.
3. You lift your fist towards your shoulder?
   - The front muscle of the upper arm contracts and the back one relaxes.
4. You close your eyelid?
   - Eyelid muscle contracts.
5. There are no muscles around your eyeball?
   - You cannot move your eyes in different directions.
6. You twist your body to one side?
   - The two muscles on that side contract together and the two muscles on the other side relax together.
7. The diaphragm muscle contracts?
   - The lungs take in oxygen from air.
8. The digestive system doesn't turn the food into nutrients?
   - The body cannot get energy.
9. The human body is exposed to a danger situation. (concerning the stored glycogen)?
   - The glycogen will be converted into glucose.
10. Your body did not remove wastes?
    - You would become sick.
11. The blood enters the nephrons?
    - Nephrons filter the blood and remove harmful substances from the body.
12. The pancreas is not working properly in the human body?
    - The person may suffer from diabetes.
13. People with diabetes not obtain regular shots of insulin?
    - Sugar level increases in the blood.

5 Revision on Concept 2

1 Choose the correct answer:

1 The muscles of ..... are involuntary muscles.
a. neck b. heart c. abdomen d. forearm

2 Liver and muscles can store ..... in the form of ..... .
a. fats - glucose b. glucose - glycogen
c. glycogen- glucose d. glycogen - fat

3 All the following are involved in excretion process, except the ..... .
a. urinary system b. skin
c. digestive system d. respiratory system

4 Urine leaves the kidneys and passes to the ..... .
a. urethra b. nephron c. blood d. bladder

5 ..... and ..... can't pass through nephron's membrane.
a. Salt - red blood cells b. Protein - salt
c. Salt - water d. Protein - red blood cells

6 Insulin is produced by the ..... .
a. liver b. stomach c. gallbladder d. pancreas

7 Nutrients are carried to the blood via blood capillaries in the wall ..... .
a. large intestine b. small intestine c. stomach d. mouth

8 The ..... system controls the body temperature and blood pressur
a. digestive b. respiratory c. urinary d. endocrine

9 The circulatory system carries all the following materials through t body, except ..... .
a. hormones b. gases c. glands d. nutrients

10 ..... purify the blood from harmful waste.
a. Lungs b. Kidneys c. Bladders d. Arteries

11 When you are stressed out, your ..... increase(s).
a. heartrate only b. blood pressure only
c. bones' size d. heartrate and blood pressure

12 ..... system provides nutrients for the skeletal system to grow and repair itself.
a. Nervous b. Digestive c. Urinary d. Reproductive

13 A diabetic person's body can't make or use ..... .
a. salt b. insulin c. protein d. muscles

14 When you twist your body, the ..... muscles move.
a. abdominal b. intestine c. heart d. eyelid

15 ..... are microscopic filters found in each kidney.
a. Glands b. Bladders c. Nephrons d. Blood vessels

16 The heartbeats in the ..... system accelerates when feeling afraid.
a. urinary b. nervous c. circulatory d. digestive

17 Sweat is excreted by the ..... .
a. skin b. lungs c. heart d. kidneys

18 Urine leaves the kidney through ..... to collected in ..... .
a. urethra, bladder b. slender tube, bladder
c. artery, bladder d. bladder, urethra

19 Solid wastes leave the body through ..... .
a. Gallbladder b. anus c. pancreas d. mouth

2 Put (✓) or (✗):

1 Involuntary muscles can move spontaneously without even thinking of it. ( )

2 Insulin pumps help people who suffer from kidney failure. ( )

3 A human can control the movement of blood in his body. ( )

4 The cells of a multicellular organism have different shapes and sizes. ( )

5 The tissue consists of a group of organs. ( )

6 The nephron is the functional unit of the kidneys. ( )

7 The excretory system uses blood to carry oxygen from the lungs t the body. (

8 Saliva is a hormone that breaks down food chemically in the mouth. (

9 Undigested food enters the large intestine as a soupy mixture. (

10 The liver and muscles can't release the glucose when they need it. (

11 Water is absorbed from undigested food in the small intestine. (

12 The skin takes part in expelling sweat through the pores. (

13 In the kidney's model, paper filter stimulates the membrane inside nephron. (

14 When the heart beats faster, the blood pressure decreases. (

15 Urination is the process of expelling blood outside the body. (

16 The body can store nutrients as fat and glucose. (

3 Write the scientific term:

1 Muscles that move your bones.

2 A group of organs that work together to perform a specific functior

3 The process of removing wastes from the blood by the two kidneys

4 An enzyme that moistens food in the mouth.

5 The system that collects and gets rid of waste materials in the human boc

6 A bundle of long fibers that can contract to allow body movement.

7 An organ that sends a signal to muscles to begin responding to any threat.

8 Muscles that move automatically without thinking of it.

9 The organ of the digestive system where the nutrients are absorbed

10 The system that is responsible for eliminating carbon dioxide from th body.

11 The last section of the large intestine is where stool is stored.

12 A blood vessel through which the blood enters each kidney.

13 The muscles that move the teeth to chew food.

14 The system that consists of bones, muscles, cartilages, tendons, an ligaments.

4 Complete the following sentences using the words between the brackets:

A

(sugar – water - cells – stamina – blood – brain)

1. Insulin moves sugar through ..... to ..... to get energy.
2. ..... is absorbed from the undigested food in the large intestine.
3. A diabetic person must carefully monitor the level of ..... in their blood.
4. Respiratory system sends more oxygenated blood to the muscles and ..... to increase ..... and reflexes.

B

(tendons – diaphragm – hormones - endocrine system – bones)

1. Skeletomuscular system consists of muscles, ... and ..... .
2. During a fight-or-flight response, ... are released by the ..... .
3. When the ..... muscle contract, the lung take in air.

C

(nutrients – artery – blood - adrenal glands – sympathetic nervous – force – kidney)

1. Nerve cells need ..... to do their work, while muscles exert a ..... when they contract.
2. During acute stress, ... system stimulates ..... to produce hormones.
3. ..... enters each ..... through a large artery to be filtered.

5 Cross out the odd word:

1. Heart – Artery - Blood capillaries – Kidney
2. Stomach – Heart - Esophagus – Mouth
3. Skin – Kidney – Bladder – Urethra

6 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Glycogen	a. is a solid waste that is stored in rectum.
2 Stool	b. is stored in bladder.
3 Urea	c. is a type of an animal starch.
4 Urine	d. is produced from breaking down proteins in body cells.

1 ..... 2 ..... 3 ..... 4 .....

B

Column (A)	Column (B)
1 Circulatory system	a. allow body movement.
2 Musculoskeletal	b. releases hormones into the body.
3 Endocrine system	c. breaks food into molecules that the body absorbs.
4 Digestive system	d. transports gases, hormones and nutrients through the body.

1 ..... 2 ..... 3 ..... 4 .....

7 Give reasons for:

1 Your heart pumps more blood to your muscles when you run.

.....

2 Muscle cells need to be shaped like long fibers.

.....

3 The heart is an involuntary muscle.

.....

4 When facing danger, your blood pressure increases.

.....

5 Nephrons are considered as microscopic filters.

.....

8 What happens if:

1 You watch a scary movie?

.....

2 People with diabetes don't obtain regular shots of insulin?

.....

3 The person's kidney is damaged?

.....

4 The diaphragm muscle relaxes?

.....

5 Skin doesn't have any pores?

.....

9 In the following figures:

1 The opposite figure represents ..... .

2 Write the following labels:

a .....

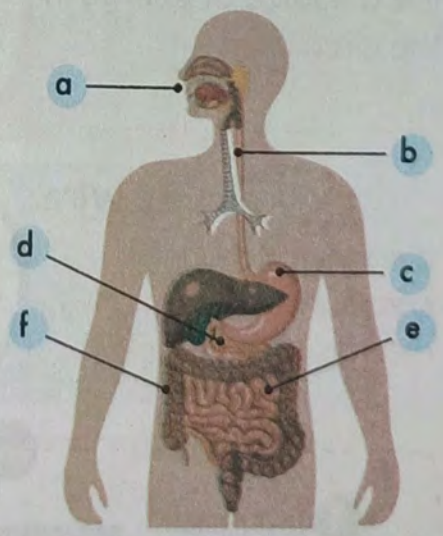
b .....

c .....

d .....

e .....

f .....



3 **Choose:**

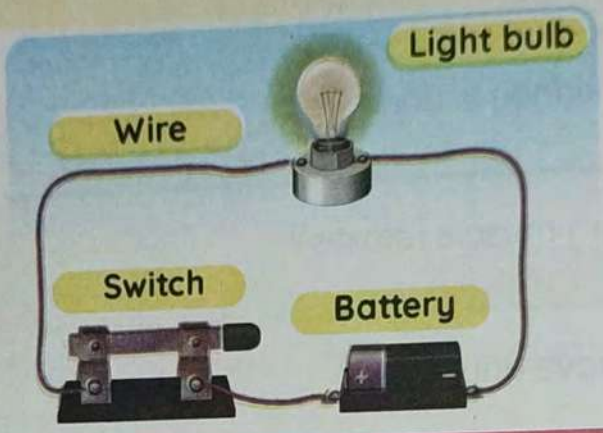
The parts (a – f – d) produce both digestive enzymes and a hormone.

Concept 3 Energy as a System

1 Summary of Concept 3

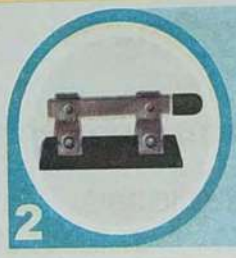
Electric Circuit

Electric Circuit • It is a closed path that electricity flows through.



The Components of Electric Circuit

Battery
It is a source of energy in the circuit.



Switch
It is a device that help in opening and closin electrical circuits.

Wire
It connects the components of an electric circuit together.

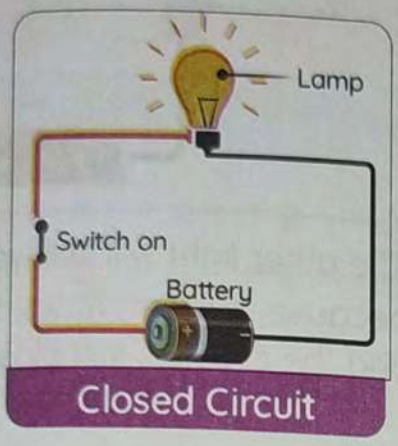
Light bulb
It shows the transfer of electricity.

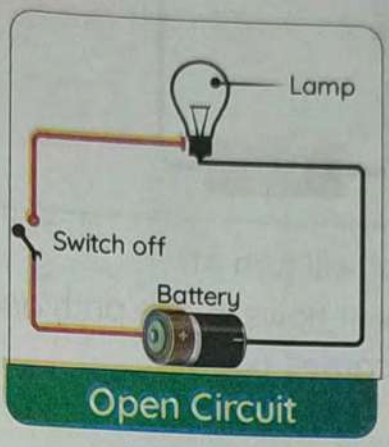
A switch can be:

1 Manual
Such as a wall switch for lights.

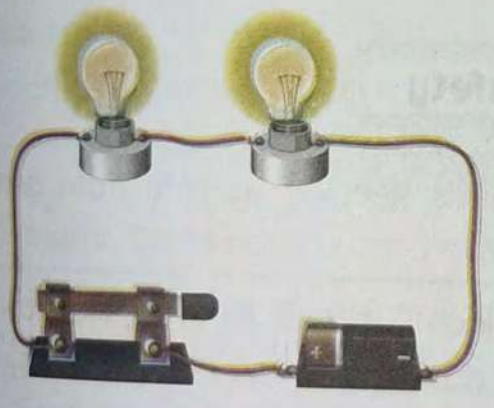
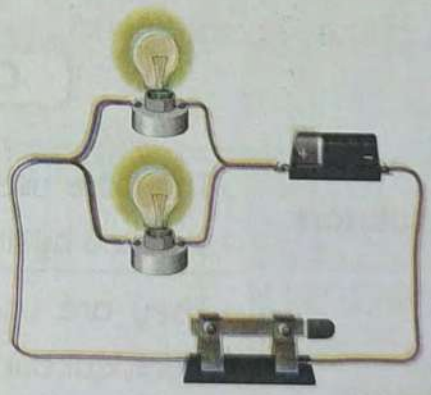
2 Automatic
Such as the internal switch on a thermostat

- All parts of an electric circuit must conduct electricity.
- The circuit works as one unit, like a **system** to make electricity flow.
- **Electrical poles** supporting wires outside and the wires inside walls are all examples of **electric circuits**.

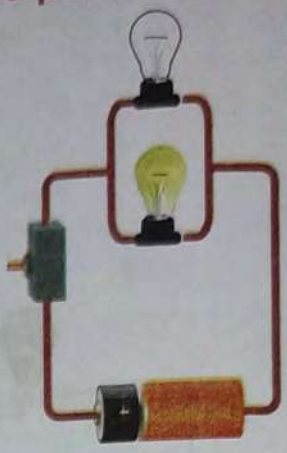




- **There are two ways of connecting for electric circuits.**

Series Circuit	Parallel Circuit
A way of connection in which lights are connected in **one path**.	A way of connection in which lights are connected by **multiple paths**.
	
Electric current	
Current flows in a **single (one)** path.	Current flows in **multiple** paths.

What happens if... One light is turned off

in a series circuit?	in a parallel circuit?
	
The other light will turn off because current flows in one path and the circuit becomes **open**.	The other light will still work because current flows in two path and the circuit is still **closed**.

Electric circuit at houses:

- A **parallel circuit** is the type of circuit you would find in your house.
- You can operate a **blender**, **toaster**, and **TV** all at the same time, but if you turn one off, the others will continue to work just fine.

Current Safety

1 Insulators	• They are used to coat wires, keeping us safe from getting shocked by the current.
2 Elecrtic Resistors	• They are used in the electric circuit to limit the flow o electrical current to limit damage to the components of c circuit • Resistors are found in **toasters**, **microwaves**, and **electri stoves**.

Materials can be classified into two types

1 A conductor

A material through which electricity flows easily.

Such as copper and aluminum.

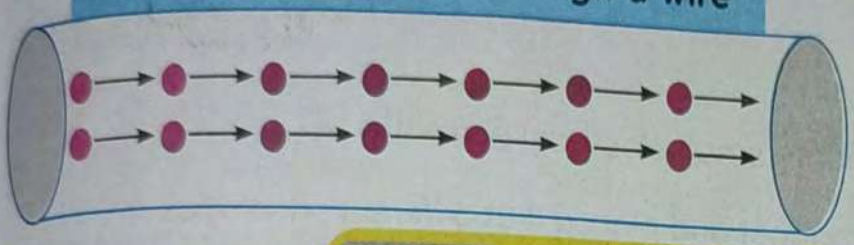
2 An insulator

A material through which electricity does not flow easily.

Such as rubber and plastic.

Electricity ● It is the flow of charged particles (electrons) through a wire.

The flow of electrons through a wire



Electrons

They are tiny charged particles that flow in a closed electric.

Generating Electricity

- Most of the world's electricity generation is carried out in **electric power plants** that use a **turbine** to drive **generators**.
- Turbines can run on **renewable** or **non-renewable resources**.

- **Turbine:** It is a device used to drive (spin) a generator..
- **Generator:** A device that changes **kinetic (mechanical)** energy into **electrical** energy.

How does a generator work?

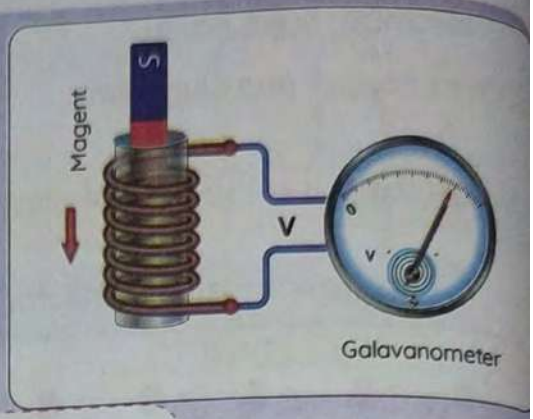
- Different forces can be used to make the magnets spin at a high rate of speed. For example,
  - **Wind-powered turbines** can be used to spin magnets.
  - **Water from a dam** flows across the turbine, causing the magnets to spin.
  - **Fuels, such as oil and coal** are used to make water boil.
    - This creates steam, which causes a turbine to spin.

- The spinning magnets create an electrical charge on the surrounding wire and electricity is produced.
- Electricity travels along conductors called power lines into all kinds of electrical equipment in homes, businesses, and factories.

Magnetism and Electricity:

A scientist conducted an experiment

1. He tightly coiled a copper wire around a hollow cylinder.
2. He connected this coil to a galvanometer.



Galvanometer

A device used to indicate small electrical currents.

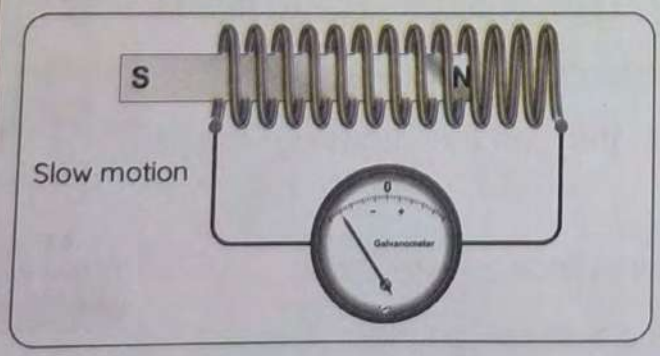
3. He then took a bar magnet and placed it at different proximities in relation to the coil.

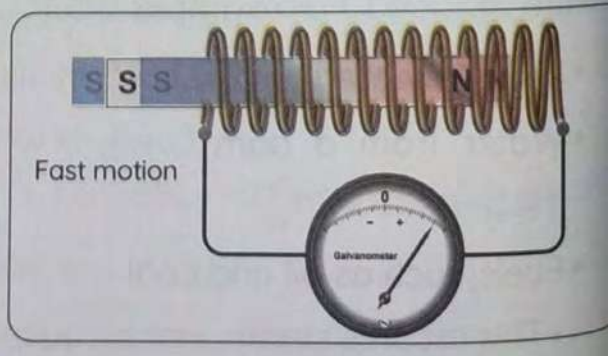
If	Then
The magnet sat at rest away from the coil,	→ the needle of the galvanometer did not move, indicating there was no current flow.
The magnet moved toward and into the cylinder,	→ the needle moved to one side, indicating that there was current flow.

Factors Affect the Induced Current:

1 Speed of Magnet

- As the magnet moves faster, the needle moves faster, indicating an increase in the voltage.





2 Number of Loops

» As the number of coiled loops increases, the needle moves faster, indicating an increase in the voltage.

Where is electromagnetic induction used?

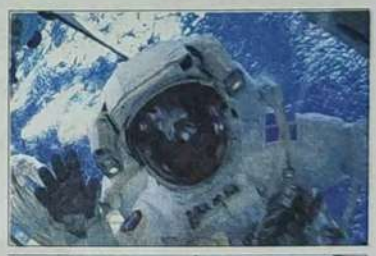
Electromagnetic induction is now used in **electric motors**, **generators**, and **transformers**.

Electromagnetic induction:

It is the process of generating an electric current using a magnet field.

Magnetism and Gravity

1 Gravitational Force



» It is the force that attracts objects with mass downward to the Earth's center.

» **When you throw an apple up into the air?**
It will stop moving upward and fall back to Earth due to gravity.

Factors Affecting Gravity:

1 Mass	• As the mass **increases**, the gravity **increases**.
2 Distance	• As the distance between objects and the center of the Earth **increases**, the gravitational force **decreases** and vice versa.

2 Magnetism

» The force that allows the magnet to **attract** magnetic materials or other magnets towards it.

- Magnets are made of **iron** and **other materials**.
- All magnets have a **north pole** and a **south pole**.
- A magnet attracts magnetic material, but it doesn't affect non-magnetic material.
- A magnet attracts **magnetic materials** that only lie in its **magnetic field**.

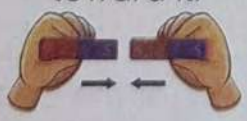
We can classify materials into two types:

P.O.C	Magnetic Materials 	Not-magnetic Materials 
Definition	• They are materials that attracted to magnets	• They are materials that aren't attracted to magnets
Examples	Iron - Steel - Nickel	Copper - Aluminium - Plastic - Carton

Magnetism allows the magnet to:

1 Attract (pull)

other magnets toward it.

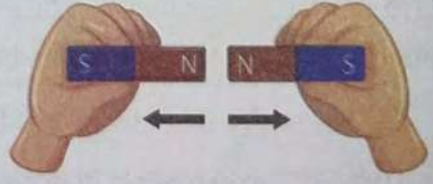


Different poles are attracted to each other.

some materials.

2 Repel (push)

other magnets away.



The same poles are repelling each other.

» Magnets produce a field around them called the **magnetic field**.

Magnetic Field The space around the magnet in which the effect of magnetic force appears.

» You can allow a magnet to interact with small iron filings.
» The pattern that the iron filings make near the magnet is the outline of the **magnetic field**.

P.O.C	Gravitational Force	Magnetism
Differences	• It attracts and never repels. • Gravity affects all objects that have mass on earth or near it.	• It attracts or repels. • It only attracts specific materials that lie in its magnetic field.
Similarities	• **Both are invisible forces.** G.R – Because we cannot see the **magnetic** field or gravitational force can only observe their effects. • **Both are not-contact forces.** G.R – Because they affect objects without direct contact.	

Invisible force:
A force that we can't see, but we can see its effect.

Not-contact force:
A force that doesn't need objects to touch each other.

The Heart: Natural Pacemaker:

• The heart is an amazing muscle (organ).

Function (Job):
It beats consistently for the duration of our lives.

» **The heart is a natural pacemaker.** G.R
• Because the pacemaker creates electrical currents that it sends out through the heart, causing the heart to contract.

» **Some people whose pacemakers start to fail need an artificial pacemaker.** G.R
• To keep the heart beating correctly.

The Artificial Pacemaker:

- A battery-operated device that is inserted into the chest and stimulates the heart muscle to beat at regular intervals for patients who have slow or irregular heartbeats.

- A pacemaker has been in use for over 60 years.
- The artificial pacemaker has a built-in antenna. G R
  - To send information to physicians, so they know how the heat is behaving.
- Pacemakers are becoming smaller too.

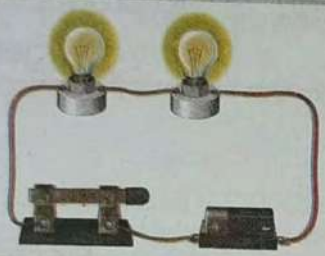
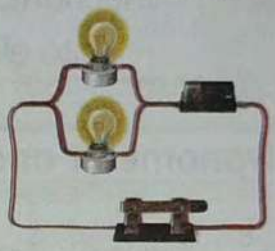
2 Definitions of Concept 3

Electricity (Electric current)	It is the flow of charged particles (electrons) through a wire.
Electric circuit	It is a closed path that electricity flows through.
Battery	It is the source of electrical energy in the electric circuit.
Switch	It is the device that helps in opening and closing electrical circuits.
Thermostat	It is the device that has an automatic switch to turn on and off some appliances.
Series circuit	It is the way of connection in which lights are connected in a single path.
Parallel circuit	It is the way of connection in which lights are connected in multiple paths (different branches).
Invisible force	It is the force that we can't see, but we can see its effect.
Non-contact force	It is the force that doesn't need objects to touch each other.
Gravitational force	It is the force that attracts objects with mass downward to the Earth's center.
Magnetic field	It is the space around the magnet where its magnetic force appears.
Magnetic materials	They are materials that are attracted to magnets.

Non-magnetic materials	They are materials that are not attracted to magnets.
Generator	It is the device that changes mechanical (kinetic) energy into electrical energy.
Electrons	They are tiny charged particles flowing in a closed elect circuit.
Conductors	They are the materials that allow electricity to flow through easily.
Insulators	They are the materials that don't allow electricity to flo through easily.
Electric resistors	They are parts of a circuit that limit the flow of electrica current.
Power plants	They're facilities that provide towns and factories with electricity.
Power lines	They are conductors that transport the electricity from power stations to all the city.
Galvanometer	It's a device used to indicate small electrical currents in circuit.
Artificial pacemaker	It's a battery-operated device that is inserted into the chest and stimulates the heart muscle to beat at regula intervals for patients who have a slow or irregular heartbeat.

3 Comparisons of Concept 3

1 Series Circuit and Parallel Circuit

	Series Circuit	Parallel Circuit
Definition	It's a way of connection in which lights are connected in **one path**	It's a way of connection in which lights are connected in **multiple paths.**
If one bulb burns out,	The other bulb will turn off.	The other bulb will still work.
Figure		

2 Conductors and Insulators

	Conductors	Insulators
Definition	They are the materials that allow electricity to flow through them easily.	They are the materials that don't allow electricity to flow through them easily.
Examples	All metals, such as: Iron - Copper - Aluminum - Lead - Silver	Wood - Plastic - Rubber - Cloth - Paper
Uses	They are used in making electric cords and wires (cables).	They are used in coating electric conductors.

3 Magnetic and Non-magnetic materials

	Magnetic Materials	Non-magnetic Materials
Definition	They are materials that are attracted to magnets.	They are materials that are n attracted to magnets.
Examples	Iron - Nickel - Steel	Copper - Aluminum - Wood Plastic - Rubber

4 Generator and Turbine

	Generator	Turbine
Usage	It is used to convert mechanical (kinetic) energy into electrical energy.	It is used to run huge magne to produce electricity in th generator.

5 Galvanometer and Resistor

	Galvanometer	Electric Resistor
Usage	It is used to detect small electric currents in a circuit.	It is used to limit the flow o electric current in a circuit prevent the damage of its components.

4 Give Reasons for... Concept 3

1. Both gravity and magnetism are invisible forces.
   - Because we cannot see them, but we can only observe their effects.
2. Both gravity and magnetism are non-contact forces.
   - Because they affect objects without being in contact with them.
3. The electric circuit is considered a system.
   - Because it is a group of things that work together to make electricity flow.
4. In a series connection, if one of the bulbs burns out, the other bulbs will be turned off.
   - Because the electric current flows in one path.
5. If we put a piece of paperclip near a wire having an electric current, it will be attracted to it.
   - Because the electric current produces a magnetic field.
6. If you through an object up in the air, it will return to the ground.
   - Due to the gravity that pulls everything down to the Earth's center.
7. The steel pins are magnetic materials.
   - Because they are attracted to the magnet.
8. The plastic fork isn't attracted to a magnet.
   - Because it is a non-magnetic material.
9. A generator uses magnets and conductors.
   - To produce and transport electricity to light homes and operate devices.
10. Touching an uninsulated wire will give you an electric shock and could even kill you.
    - Because our bodies contain a lot of water, and water is a good conductor of electricity.
11. Aluminum foils, paperclips, coins and silverware are conductors.
    - Because electricity can flow through them easily.
12. Rubber, cloth and wooden spoons are insulators.
    - Because electricity cannot flow through them easily.

13 Electricity is very important in our daily lives.
- Because we use it to operate many devices.

14 Electric current doesn't pass through an open electric circuit.
- Because there's a break in the circuit that makes it uncompleted loop.

15 Insulators are used to coat wires.
- Because they keep us safe from getting shocked by electricity as prevent the flow of electricity.

16 Resistors might be used to slow the flow of electrons through a circuit.
- To limit the flow of electric current through the circuit.

17 A parallel circuit is the type of circuit you would find in your house.
- Because you can operate more than one device at the same time. If turn one off, the others will continue to work just fine.

18 Heart is a natural pacemaker.
- Because the heart has its own built-in little pacemaker that creates elec currents and sends them out through the heart, causing the heart to con

19 An artificial pacemaker is implanted in the chests of some patients.
- To keep the heart beating regularly.

5 What Happens If...? Concept 3

1 One light burns out in a series circuit?
- The circuit is opened (broken), so all light bulbs are turned off.

2 One light burns out in a parallel circuit?
- The circuit is still closed, so the other light bulbs are still working.

3 An electric current flows through a wire?
- A magnetic field is produced around the wire.

4 You throw an apple up into the air?
- It will stop moving upward and fall back to the Earth due to gravity.

5 You approach the north poles of two magnets with respect to each oth
- They will repel each other.

6 **You sprinkle iron filings near a magnet on a flat surface?**
- They will make a pattern of its magnetic field.

7 **You approach a magnet to a mixture of sand and iron filings?**
- The magnet only attracts the iron filing, but doesn't attract the sand.

8 **You put a paperclip in the middle between two magnets that have different sizes?**
- It will get attracted to the bigger magnet.

9 **The turbine of the generators spin?**
- It moves the magnets to produce an electric current.

10 **You turn the switch off in the electric circuit?**
- This causes a break in the circuit and stops the flow of electrons.

11 **You turn the switch on in an electric circuit?**
- This allows electrons to move through the circuit.

12 **The turbines of a generator stop spinning or are damaged?**
- It will not generate electricity.

13 **A paperclip is placed in a circuit with a battery and bulb?**
- Electricity will flow, and the bulb will light.

14 **An eraser is placed in a circuit with a battery and bulb?**
- Electricity will not flow, and the bulb will not light up.

15 **A television is connected to a blender in a series circuit?**
- They will be turned on and off together at the same time.

16 **A toaster has no resistors?**
- The toaster will be damaged.

17 **The speed of a magnet moving inside a coil connected to a galvanometer increases?**
- The needle of the galvanometer moves faster, indicating an increase in the voltage.

18 **The number of the coil loops in which a magnet is moving decreases?**
- The needle of the galvanometer moves slower, due to the low induced current.

19 **The natural pacemaker of the heart starts to fail?**
- The heart will not contract correctly, so they need an artificial pacemaker.

6 Revision on Concept 3

1 Choose the correct answer:

1. A/An ..... is used to open and close the electric circuit.
   a. wire **b.** switch **c.** electric lamp **d.** battery
2. A series circuit allows the current to flow in ..... path(s).
   a. one **b.** two **c.** three **d.** multiple
3. The ..... is the space around a magnet where its force appea
   a. magnetic pole **b.** magnetism
   c. magnetic field **d.** magnetic material
4. Which magnets are better at attracting objects from a farther dista
   a. Small magnets **b.** Medium magnets
   c. Large magnets **d.** Weak magnets
5. ..... are used to run electric generators.
   a. Light bulbs **b.** Turbines **c.** Iron nails **d.** Batteries
6. ..... change mechanical energy into electrical energy.
   a. Motors **b.** Electric lamps
   c. Electric fans **d.** Generators
7. A magnet will attract the scissors if they contain ..... .
   a. iron **b.** copper **c.** plastic **d.** wood
8. On sprinkling iron filings on a magnet, we can see the ..... .
   a. mass of its magnetic field **b.** shape of its poles
   c. pattern of its poles **d.** pattern of its magnetic fiel
9. The force of the induced current by a moving magnet in a depends on the ..... .
   a. number of coil loops **b.** speed of the magnet
   c. number of galvanometers **d.** a and b
10. The generator produces ..... energy.
    a. mechanical **b.** chemical **c.** light **d.** electrical

11 A pacemaker is implanted in the patient's _____.
a. stomach b. chest c. pancreas d. liver

12 A small magnet can attract a paperclip at a distance of _____ better than a magnet at a distance of 5 cm.
a. 3 cm b. 6 cm c. 10 cm d. 8 cm

13 All the following are electric insulators, except _____.
a. rubber b. wood c. copper d. plastic

14 Electric cords are coated with _____.
a. copper b. aluminum c. iron d. plastic

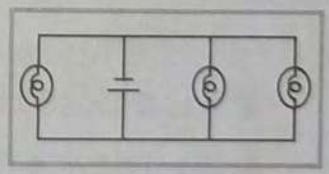
15 A _____ is used to indicate the current in a circuit depending on the magnetic field.
a. resistor b. galvanometer c. battery d. generator

16 The magnetic field produced when an electric current passes through a wire is _____ that in a wire wrapped around a metal core.
a. weaker than b. equal to c. stronger than d. typical to

17 A _____ is used to decrease the flow of electrons passing in an electric circuit.
a. resistor b. galvanometer c. turbine d. battery

18 A pacemaker is very helpful for people suffering from _____.
a. diabetes b. asthma
c. heart problems d. hearing problems

19 If one bulb from the opposite circuit is burnt out, _____.
a. the other bulbs will turn off
b. the other bulbs will stay on
c. the battery will become stronger
d. no correct answer



2 Put (✓) or (✗):

1 The magnet has two poles. ( )
2 Electricity can't be related to magnetism. ( )
3 Steel pins are considered conductors. ( )
4 Electrons must be static to produce a magnetic field. ( )

5 Water flowing on a dam can be used to move the turbines of a generator. (
6 An insulator resists the flow of electricity. (
7 In a generator, many large magnets spin at a slow speed. (
8 The battery is the source of electric current in the electric circuit. (
9 The heart is a bone that has its own built-in pacemaker. (
10 The force of a magnet depends on the size of the magnetic material. (
11 By increasing the loops of a coil in which a magnet is moving, it generates more induced current. (
12 As the distance between an object and the Earth's surface increases, the gravity increases. (
13 Magnets are used in motors and computers. (
14 Power lines bring an electric current to the battery. (
15 Nickel is attracted to the magnet as it is a non-magnetic material. (
16 Magnets are made of iron only. (

3 Write the scientific term:

1 It's an injury that results from passing an electric current through th human body.
2 They are materials that are attracted to a magnet.
3 It's a facility that is used to generate electricity for homes, streets ar factories.
4 It is a closed loop for transmitting an electric current.
5 It's a device that has an automatic internal switch.
6 They're tiny charged particles that flow through an electric circuit.
7 It's a device that converts mechanical energy into electrical energy.
8 It's the type of a circuit you would find in your house.
9 It's a device used to detect a small electrical current in a circuit.
10 It's a device used to help people with irregular or slow heartbeats.
11 They're materials that allow electricity to flow through freely.

12 It's a part of the galvanometer that indicates the presence of voltage in the circuit.

13 It's the force that allows the magnet to attract or repel certain materials or other magnets towards itself.

14 They're materials that don't allow an electric current to flow though easily.

15 It is the movement of charged particles through a conducting wire.

4 Complete the following sentences using the words between the brackets:

A

(turbines - series - steam - magnetic field - heartbeats - electric charges - parallel)

1 In a ..... circuit, each bulb has its own circuit.

2 When water boils, it produces ..... that causes ..... to rotate.

3 In a ..... circuit, the electric current passes through only one path.

4 A pacemaker helps patients who have irregular ..... .

5 The electric current that passes through a wire has a ..... .

B

(work - huge magnets - plastic - turbines - hands - electric charges)

1 In a generator, the spinning turbines move ..... that create ..... on the wire.

2 The electrons exert a ..... during flowing through the electric circuit.

3 Electric wires are wrapped with ..... to prevent the flow of electricity to our ..... .

5 Cross the odd word out:

1 Nickel - Steel - Silverware - Iron

2 Plastic - Rubber - Iron - Wood

3 Aluminum - Iron - Copper - Cloth

6 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Iron	a. is a non-magnetic material that conducts electricity.
2 Copper	b. is found in a pacemaker.
3 Built-in antenna	c. is a magnetic material that conducts electricity.

1 ..... 2 ..... 3 .....

B

Column (A)	Column (B)
1 Earth	a. is an invisible and non-contact force.
2 Electromagnetic induction	b. flows through a closed electric circuit.
3 Gravity	c. is used in electric motors and generators
4 Electric current	d. has more gravitational force than that of the moon.

1 ..... 2 ..... 3 ..... 4 .....

7 Classify the following objects into electric conductors and insulators:

(Copper - Plastic - Rubber - Silver necklace - Aluminum - Human body - Cloth - Wood - Iron)

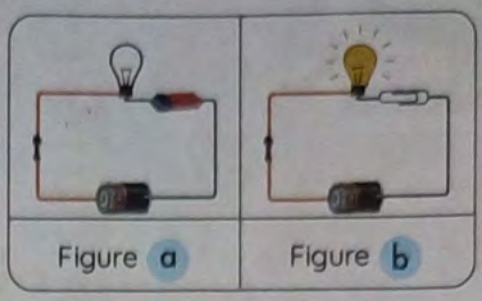
Electric Conductors	Electric Insulators

8 Look at the following figures, then answer the questions below:

A

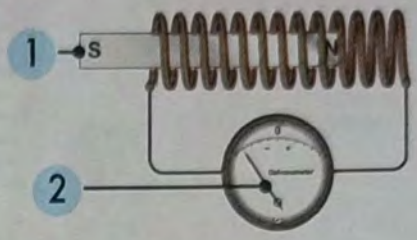
1. Figure (.....) represents a closed electric circuit because .....
2. What happens if you removed the battery from figure (b)?

.....



B Answer the following:

1. Number (1) represents: .....
2. Number (2) represents: .....
3. If we push and pull (1) inside the hollow cylinder, ... force will be produced.



9 Give reasons for:

1. Ann electrical fire increases while extinguishing it with water.
2. An electric current doesn't pass through an open electric circuit.
3. In a series connection, if one of the bulbs burns out, the other bulbs are turned off.
4. Resistors might be used in an electric circuit.
5. If you throw an object up in air, it will return to the ground.
6. A galvanometer needle deflects on moving a magnet inside a coil.

10 What happens if:

1. You approach a magnet to a mixture of copper filings and steel pins?
2. The turbines of a generator stop spinning?
3. A person is exposed to an electric shock?
4. A bulb is burned out in a series circuit of 5 bulbs?
5. You move a magnet inside a coiled wire?
6. Yoy increase the speed of a magnet moving inside a coiled wire (according to the galvanometer's needle)?

Theme 2

Matter and Energy

Unit 2

Getting Energy

Unit Concepts:

Concept 1 Thermal Energy and States of Matter

Concept 2 Heat Transfer

Concept 1 Thermal Energy and States of Matter

1 Summary of Concept 1

Matter • It is anything that has mass and takes up space.

- Any matter consists of **tiny, moving particles** (molecules or atoms).
- Matter around us often changes from one state to another.
- Thermal energy, heat transfer and temperature are involved in these changes.

States of Matter

Solid

Ex. Pencil – Table

Liquid

Ex. Molten wax – Food oil

Gas

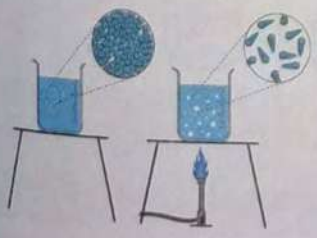
Ex. Steam – Water vapor

When the substance is **heated**, the **kinetic energy** of its particles increases and moves **faster**.

Thermal Energy, Heat Transfer and Temperature

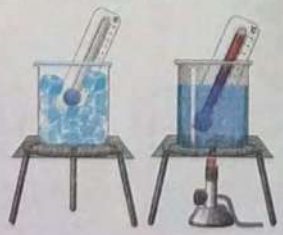
1 Thermal Energy:

- It is the total sum of the kinetic energy of a substance's atoms and molecules.



2 Temperature:

- It is a measure of the average kinetic energy of the particles (atoms and molecules) in a substance.



3 Heat Transfer:

- It is the transfer of energy from a **hot** object to a **cold** object.

Final Revision

- There are three ways of transferring heat: **conduction**, **convection**, and **radiation**.
- Temperature indicates how hot or cold a substance is.
- Temperature is measured using a **thermometer**.

Heat could be used in

Changing the state

When an ice cube is heated, it melts.

Changing the matter

When a paper is heated, it burns.

Shaping the matter

Heat is used to shape and form glass.

How does glassblowing happen?

First: Heating

The material is **heated** in a hot furnace so it can be **melted** into a liquid that can be shaped.

Second: Shaping

Liquid can be shaped easily by being blown from the open end of a hollow tube.

Thrid: Cooling

Once the glassblowe is finished, the materi must be **cooled** back into a solid to maintai the new shape.

1 Heating

Adding thermal energy that causes

Melting

It is the change of matter from a **solid** state to a **liquid** state by heating.

Evaporation

It is the change of matter from a **liqui** state to a **gaseous** state by heating.

2 Cooling

Removing thermal energy that causes

Freezing

It is the change of matter from a **liquid** state to a **solid** state by **cooling**

Condensation

It is the change of matter from a **gaseous** state to a **liquid** state by **cooling**

Melting Point	Boiling Point
It's the temperature at which the substance changes from a solid state to a liquid state.	It's the temperature at which the substance changes from a liquid state to a gaseous state.

Melting Point

Ice

0°C

Boiling Point

Water

100°C

Mercury

Highest boiling point

The way that molecules are arranged is known as **expansion** and **contraction**

Thermal Expansion	Thermal Contraction
It's a change that occurs to the molecules of a substance producing an **increase** in their movement, so they spread out or expand.	It's a change that occurs to the molecules of a substance producing a **decrease** in their movement, so they come closer or contract.

Expansion

means increasing the size (volume)

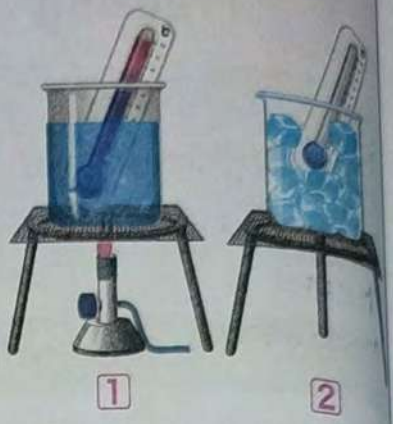
Contraction

means decreasing the size (volume)

Applications on Expansion and Contraction

Thermometer:

- Many thermometers contain colored alcohol.
- What happens when you put a thermometer in substances of different temperatures?
  1. Thermal expansion occurs as the liquid in the thermometer is heated.
  2. Thermal contraction occurs as the liquid in the thermometer is cooled.



1 2

- **Hot running water may help us open a jar lid that is stuck.**
  As the jar's lid is heated, the metal in the lid expands, making it looser.

- **Bridges and other structures are often built with expansion joints.**
  - As the bridge is heated, the metal making up the bridge expands.
  - The expansion joints allow this to occur safely without causing the bridge to buckle.

Engineers when designing structures

Engineers use many **techniques** when designing bridges to make sure they stay safe over time.

Engineers apply the principles of **expansion** and **contraction** when designing structures.

2 Definitions of Concept 1

Matter	• It is anything that has mass and takes up space. • It is anything that is made up of tiny particles that take up space.
Thermal (heat) energy	It is the total sum of the kinetic energy of a substance's atoms and molecules.
Temperature	It is a measure of the average kinetic energy of the atoms and molecules in a substance.
Atom	It is the smallest building unit of matter.
Kinetic energy	It is the energy of motion.
Melting	It is the change of matter from a solid state to a liquid state by heating.
Evaporation	It is the change of matter from a liquid state to gaseous state by heating.
Freezing	It is the change of matter from a liquid state to a solid state by cooling.
Condensation	It is the change of matter from a gaseous state to a liquid state by cooling.
Freezing point	It's the temperature at which the substance changes from a liquid to a solid state.
Boiling point	It's the temperature at which the substance changes from a liquid to a gaseous state.
Melting point	It's the temperature at which the substance changes from a solid to a liquid state.

Thermal expansion	It is the spreading out of the particles inside a substance as it gets warmer.
Thermal contraction	It is the movement of particles inside a substance as it gets cooler.
Expansion joints	They are features in bridges, sidewalks and railway tracks to protect them from buckling in hot weather and cracking in cold weather.

3 Important Uses Concept 1

Thermometers	They are used in assessing our health, predicting the weath and cooking.
Expansion joints	They protect bridges, sidewalks and railway tracks fro buckling in hot weather and cracking in cold weather.

4 Comparisons of Concept 1

Melting	Freezing
• It is the process by which a substance changes from a solid to a liquid state by heating.	• It is the process by which a substance changes from a liquid to a solid state by cooling.

Evaporation	Condensation
• It is the process by which a substance changes from a liquid to a gaseous state by heating.	• It is the process by which a substance changes from a gaseous to a liquid state by cooling.

Melting point	Freezing point	Boiling point
• It is the temperature at which a substance changes from a solid to a liquid state.	• It is the temperature at which a substance changes from a liquid to a solid state.	• It is the temperature at which a substance changes from a liquid to a gaseous state.

Boiling Point of Water	Boiling Point of Mercury
100°C	357°C

Thermal expansion	Thermal contraction
• It is the spreading out of the particles inside a substance as it gets warmer.	• It is the movement of particles inside a substance as it gets cooler.
• It occurs at high temperatures or in hot weather.	• It occurs at low temperatures or in cold weather.
• It is an increase in the substance volume due to an increase in temperature.	• It is a decrease in the substance volume due to a decrease in temperature.

Dispersal of a Dye in Hot Water	Dispersal of a Dye in Cold Water
• The particles of water have more thermal energy, so they move faster, and the dye compounds disperse faster.	• The particles of water have less thermal energy, so they move slower, and the dye compounds disperse slower.

Putting a Thermometer in Hot Water	Putting a Thermometer in Cold Water
• The liquid inside the thermometer expands and rises up.	• The liquid inside the thermometer contracts and falls down.

5 Give Reasons for... Concept 1

1. The water in some pools changes into steam.
   - Because it is heated by the magma underground.
2. Glass can't be shaped in its solid state.
   - Because glass in the solid state has a fixed shape.
3. Glass is heated in a hot furnace.
   - To be easily shaped by changing its state into a liquid.
4. Glass is cooled after it is shaped.
   - To maintain its new shape.
5. Ice cubes have the least energy.
   - Because ice cubes are made of particles that move very little.
6. Water in a cup has moderate energy.
   - Because water is made up of particles with a medium amount of energy.
7. The boiling water has the most energy.
   - Because steam is made up of particles that move very quickly.
8. If you hold an ice cube, it melts.
   - Because the thermal energy is transferred from your hand to the ice cube.
9. You feel warm if you hold a cup of tea.
   - Because the thermal energy is transferred from the cup to your hand.
10. As a solid is heated, the particles vibrate faster.
    - Because they gain more energy to escape from the force that holds them.
11. Scientists test how a change in temperature affects different substances.
    - To determine which material is suitable to use in tools that take place in extreme conditions.
12. The particles of a cold substance move slower.
    - Because when the temperature decreases, the kinetic energy of the particles decreases.

13 Dye compounds spread out on adding them to water.

- Because dye compounds consist of tiny moving particles.

14 The dye disperses faster in warm water.

- Because the molecules in warm water have more kinetic energy and mo faster, so the dye takes shorter time to disperse.

15 Hot running water may help us open a jar lid that is stuck.

- Because the particles of the metallic jar lid expand.

16 Bridges and other structures are often built with expansion joints.

- Because they allow thermal expansion to occur safely and avoid bucklin

17 Thermometers have an important role in our daily lives.

- Because they are used in assessing our health, predicting the weather a cooking.

18 Bridges have built-in protection.

- To keep the bridge from buckling in hot weather and cracking in c weather.

19 Engineers use many techniques when designing bridges.

- To make sure bridges stay safe over time.

6 What Happens If...? Concept 1

1 A substance is heated?

- The thermal energy of the particles in the substance increases.

2 A substance is cooled?

- The thermal energy of the particles in the substance decreases.

3 You boil an amount of water?

- Water changes from liquid into water vapor.

4 You heat a piece of paper?

- It will burn.

5 An ice cube is heated?
- It will turn into water (liquid state).

6 You hold a piece of ice cube in your hand?
- Thermal energy transfers from your hand to the ice cube, so it melts.

7 You hold a cup of tea in your hand?
- Thermal energy transfers from the cup to your hand.

8 A solid substance is heated (concerning the movement of the particles)?
- The particles will move faster.

9 You boil some amount of water till its temperature reaches 100°C?
- It will change from the liquid state into the gaseous state.

10 The particles of the dye were static?
- They will not spread in the water.

11 You put a red food coloring drops in warm water and in cold water?
- The red color will spread out faster in warm water than in cold water.

12 You add two drops of different dye colors in two beakers containing an equal amount of water at the same temperature?
- Both dyes will spread at the same rate.

13 You add two drops or a blue dye to 200 mL of water, and four drops to 100 mL of water?
- Both dyes will spread at the same rate.

14 A jar's lid is placed under running hot water?
- It will expand and be loosened.

15 You move a thermometer from a cup of hot tea to a glass of cold juice?
- The liquid inside the thermometer will contract and move down.

16 Bridges are built without any expansion joints?
- It will cause the bridge to buckle.

7 Revision on Concept 1

1 Choose the correct answer:

1 Matter is made up of tiny units called ..... .

a. cells b. mixtures c. tissues d. molecules

2 On heating wax, it will ..... .

a. turn into solid b. melt c. freeze d. get cooled

3 What's the processes included in glassblowing?

a. Melting and condensation b. Condensation and evaporati

c. Melting and cooling d. Cooling and condensation

4 The thermal energy of the particles ..... when the substance cooled.

a. increases b. decreases c. is doubled d. won't chan

5 ..... energy is the total sum of kinetic energy of the substar molecules.

a. Thermal b. Chemical c. Light d. Potential

6 All the following are liquids, except ..... .

a. mercury b. water vapor c. food oil d. water

7 Particles of mercury have less thermal energy than those of .....

a. iron b. steam c. steel d. aluminum

8 The boiling point of water is ..... .

a. 50°C b. 30°C c. 0°C d. 100°C

9 ..... is the process of changing a liquid into gas by heating.

a. Melting b. Freezing

c. Evaporation d. Condensation

10 During ..... and ..... processes, the substance loses t thermal energy.

a. condensation, evaporation b. melting, freezing

c. freezing, condensation d. melting, evaporation

11 On decreasing the temperature of water, ...
a. its particles move faster
b. its particles kinetic energy increases
c. the dye disperses faster in it
d. its particles thermal energy decreases

12 ..... energy is the energy of motion.
a. Kinetic b. Light c. Sound d. Chemical

13 On adding 3 drops of a food coloring to hot water, the particles ..... .
a. disperse fast b. don't disperse
c. disperse slowly d. will have less thermal energy

14 On heating the molecules of a solid substance, they will ..... .
a. slow down b. contract c. expand d. shrink

15 Molecules of water are packed tightly together in its ..... state.
a. solid b. liquid c. gaseous d. plasma

16 All the following are designed with expansion joints, except ..... .
a. bridges b. thermometers
c. railroad tracks d. sidewalks

17 At the boiling point of water, all the following changes occur, except that ..... .
a. forces between the molecules get weak
b. molecules spread so far apart
c. water changes into gas
d. water changes into solid

18 The liquid in a thermometer ..... as the temperature increases.
a. contracts b. expands c. disappears d. freezes

19 The main idea of the thermometer is to change the ..... of a liquid by changing the temperature.
a. mass b. weight c. color d. volume

20 In the thermometer model, the level of liquid in the straw ..... in a bowl of hot water.
a. falls down b. rises up c. remains the same d. drops

2 Put (✓) or (✗):

1. When a substance is cooled, the speed of its particles decreases. (
2. It is hard to shape glass in a solid state because it has a definite shape. (
3. At freezing point, water particles have the highest kinetic energy. (
4. Mercury has a lower boiling point than that of water. (
5. All substances have the same boiling point. (
6. On adding thermal energy, substance particles move faster and move closer to each other. (
7. A dye spreads out in warm water faster than in cold water. (
8. Bridges and other structures may buckle if there are no expansion joints. (
9. Particles inside water move faster than those of steam. (
10. Thermometers contain a solid substance that expands and contracts by changing the temperature. (
11. When water vapor condenses, it turns into a solid. (
12. Freezing is the reverse process of melting. (
13. Heat energy can be transferred by conduction only. (

3 Write the scientific term:

1. It's an apparatus used to measure the temperature of substances.
2. It is a measure of the average kinetic energy of the matter molecule
3. It is the change of matter from a solid state to a liquid state by heatin
4. It's the temperature at which a substance changes from a solid to liquid state.
5. It is the spreading out of substance particles when getting warmer.
6. It is the movement of substance particles closer when being cooled.
7. They're features designed in bridges to avoid dangers of therm expansion of steel.
8. It is an indicator of how hot or cold a substance is.

9 It is the total sum of the kinetic energy of a substance's atoms and molecules.

10 It is the property of liquid in a thermometer that changes by changing the temperature.

11 It's the process of changing a substance from a liquid into a solid.

12 It's the process of changing the substance from a liquid into a gas.

13 It's a device we can use to predict the possible daily weather.

4 Complete the following sentences using the words between the brackets:

A

(cold - less - particles - hot - slower - contraction)

1 Bridges are designed to avoid buckling in ..... weather, and cracking in ..... weather.

2 On cooling water, its molecules will have ..... energy and they will move ..... .

3 Any compound consists of ..... .

4 Thermal ..... occurs as the liquid in the thermometer is cooled.

B

(kinetic energy - gaseous - contract - heat energy - expand - liquid - spread out)

1 The ..... gained by water molecules is changed into ..... .

2 At the boiling point, the ..... is turned to a ..... substance whose molecules ..... .

3 Metals ..... by heating and ..... by cooling.

5 Cross the odd word out:

1 Condensation - Expansion - Melting - Evaporation

2 Concrete - Ice - Steam - Steel

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Heat	a. has a higher boiling point than tha of water.
2 Thermal contraction	b. transfers from the object with the highe temperature to that of the lower one.
3 Thermal energy	c. is the total sum of the kinetic energy of a substance's molecules.
4 Mercury	d. is the movement of particles inside a substance that come closer or getting cooler.

1 ..... 2 ..... 3 ..... 4 .....

7 Give reasons for:

1 Bridges and other structures are often built with expansion joints.

.....

2 Liquids take up more space by heating.

.....

3 The particles of dye spread out in the hot water faster than in th cold water.

.....

4 An ice cube melts when you hold it in your hand.

.....

8 What happens if:

1 An ice cube is heated (according to the change of its state)?

.....

2 You added a colorless compound to the same amount of hot and cold water?

.....

3 You place a thermometer in a cup of hot tea?

.....

Concept 2 Heat Transfer

1 Summary of Concept 2

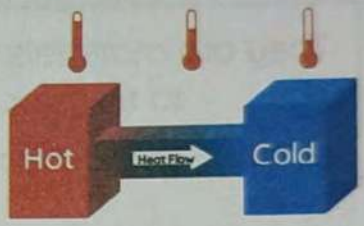
Heat transfer

- It is the transfer of thermal energy from an object with higher temperature to an object with lower temperature when two objects come in contact.

Heat transfer between two objects requires

1. Difference in temperature between the two objects
2. Two objects coming in contact

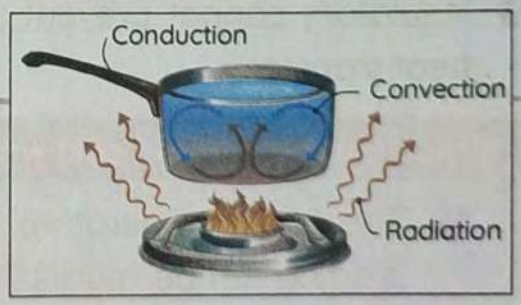
- Heat is defined as the transfer of thermal energy from a warmer object to a cooler object.
- Heat is often measured in units called calories.



Heat transfer becomes faster by:

- Increasing the difference in temperature.
- Increasing the surface area.
- Increasing the length of contact.

Heat can transfer through three ways



Conduction	• It is the direct transfer of heat from one substance to another. • Conduction takes place between solid materials in contact.
Convection	• It is the transfer of heat due to the movement of molecules of a liquid or gas.
Radiation	• It is the transfer of heat in space or air.

Importance of understanding conduction, convection, and radiation

Scientists use their understanding of conduction to design new products, such as new cookware.

Meteorologists must understand convection and radiation to help predict the weather.

Thermal Conductivity

- Substances are classified according to their thermal conductivity into:

Thermal Conductors	Thermal Insulators
They are materials that allow heat to transfer easily.	They are materials that resist the transfer of heat.

Examples

Metals, such as: Iron – Steel – Aluminum – Brass (Copper)	Wood – Plastic – Glass – Air

- Insulators cannot prevent some heat transfer, but they slow down the heat transfer.

When you mix hot and cold water together:

- The final temperature immediately after mixing is between the tw starting temperatures.

Properties of handles:

1. A handle must provide the user with comfort and safety.
2. A handle must be made up of an insulator.
3. A handle must be long in length.

Law of Conservation of Mass

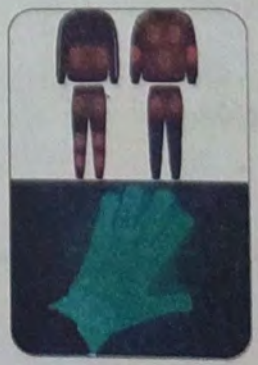
- Mass is neither created nor destroyed.
- When a substance changes its state, the mass of the substance does not change.

Materials, their Uses and Properties

Material	Made of	Properties
Plastic 	Petroleum components	Resists burning
Steel 	Iron and other elements	Strong – Hard
Concrete 	Rocks, sand and water	Very strong
Glass 	Sand, limestone and soda ash	
Shrink-wrap 	Heat is applied to plastic to make it shrink.	

Advantages of smart clothes:

1. They're made of flexible fabric that retains body heat.
2. They could control your body temperature.
3. They could light up in the dark.
4. They keep themselves clean.



2 Definitions of Concept 2

Heat transfer	It is the transfer of thermal energy from a high-temperature object to a low-temperature object when they come in contact with each other.
Thermal equilibrium	It's a condition under which there is no flow of thermal energy between two substances.
Insulators	They are materials that resist the transfer of heat.
Conductors	They are materials through which heat transfers easily.
Thermometer	It is the measuring tool of temperature.
Calories	They're the measuring units of heat.
Final temperature	It is slightly lower than the average temperature on mixing two liquids.
Conduction	It is the direct transfer of heat from one substance to another.
Convection	It is the transfer of heat due to the movement of molecules of a liquid or gas.
Radiation	It is the transfer of heat in the space or air.
Law of Conservation of Mass	Mass can neither be created nor destroyed.
Mixture	It is a form of matter made up of two or more different components that are not chemically combined.
Chemical change	It is a change that happens when two materials or more combined and form a new substance.

3 Important Uses Concept 2

Heat	It is used in cooking food and taking a warm bath (shower).
Conduction	Engineers use their understanding of conduction to design new products, such as new cookware.
Convection and radiation	Meteorologists must understand convection and radiation to help predict the weather.
Studying the matter at molecular level	It is used to help engineers for understanding the chemical structure of materials to develop new materials.
Smart clothes	• They are made up of a flexible fabric that retains body heat. • They could control your body temperature. • They could light up in the dark. • They keep the body clean.

4 Comparisons of Concept 2

	Thermal Conductors	Thermal Insulators
Definition	They are materials through which heat transfers easily.	They are materials that resist the transfer of heat through them.
Examples	Metals, such as brass, iron, and steel	Air, plastic, wood, and glass

	Conduction	Convection	Radiation
Definition	It is the direct transfer of heat from one substance to another.	It is the transfer of heat due to the movement of the molecules of a liquid or gas.	It is the transfer of heat in the space or air.
Takes Place	Between solid in contact or in metals.	When heat is transferred through the movement of liquid or gas.	When heat is transferred through space or atmosphe
Example	Putting a heating pad on sore muscles	The noodles in a boiling water pot	When you lift your face to the Sun and your face feels war

	Starting Temperature	Average Temperature	Final Temperatu
Definition	It's the temperature of an object before heating, cooling or mixing.	It's the temperature that is calculated by averaging the temperatures of two or more objects.	It is slightly lower than the average temperature after mixing two liquids.
Example	1 Temperature of hot water in beaker 1 = 70 °C 2 Temperature of cold water in beaker 2 = 10 °C	$\frac{(70 + 10)}{2} = 40$ °C	37 °C
Note	The final temperature is between two starting temperatures.		

5 Give Reasons for... Concept 2

1. A lizard feels warm when standing on a rock on a sunny day.
   - Because the rock absorbs heat energy from the Sun and then transfers that heat to the lizard.
2. The handle of an iron is made of plastic.
   - Because plastic is an insulator that resists the transfer of heat.
3. Matter has thermal energy, even if the matter feels cold.
   - Because they are made up of moving particles.
4. Iron is considered a thermal conductor.
   - Because it allows heat to transfer through it easily.
5. On leaving a bottle of cold water outside the fridge, it gets warmer after a while.
   - Because the heat transfers from the surrounding warm air to it.
6. Boiling water placed in a beaker on a table gets cooler after a while.
   - Because some heat transfers from the water to the beaker and the surrounding air.
7. When the matter becomes warmer, the molecules vibrate faster.
   - Because the molecules gain more thermal energy.
8. To fix the temperature of a too hot cup of tea, we add some cold water to it.
   - Because the heat transfers from the hot tea to the cold water.
9. Under thermal equilibrium condition, there's no heat flowing between two objects.
   - Because the two objects have the same temperature.
10. You place a heating pad on a sore muscle on your neck.
    - To transfer heat to the sour muscle on your neck to reduce the pain.
11. The noodles move up and down in boiling water.
    - Due to convection.

12 Meteorologists need to understand convection and radiation.
- To predict the weather.

13 Brass is a conductor, while wood is an insulator.
- Because brass is a metal that allows heat to flow through it, while wood resists heat transfer.

14 Handles of pots must be made of an insulator.
- To resist and slow down the heat transfer.

15 It is better to use a handle for a pot with a length of 30 cm than 20 cm.
- Because as the length of the handle increases, heat flows slower through

16 A thermos is coated with plastic.
- To resist and slow down heat transfer.

17 The popped corn does not weigh the same as the popcorn kernels.
- Because the kernels have a small amount of moisture that evaporates d heating.

18 Engineers study existing materials at molecular levels.
- To understand the chemical structures of materials and develop ne materials.

19 Concrete and bricks can't be made from cloth and stuffing of a pillow.
- Because they are soft materials.

20 Scientists and engineers try to choose the most useful materials for th product.
- To develop new materials that focus on a particular set of properties.

21 Smart clothes are very useful.
- Because they are made up of a flexible fabric that retains the body heat.

22 Heat is applied to plastic.
- To make it shrink.

23 Concrete is used as the base of buildings.
- Because it is very strong.

6 What Happens If...? Concept 2

1. Two objects with the same temperature come in contact?
   - Heat won't transfer between them.
2. The handle of an iron is made of metal?
   - Heat will reach our hands causing burns.
3. When the matter becomes warmer (concerning the atoms' kinetic energy)?
   - The kinetic energy of the atoms increases.
4. You hit an iron nail with a hammer?
   - The iron nail will get warmer.
5. You put your hand near a fireplace?
   - You will feel warm as the heat transfers to your hand by radiation.
6. You touch a metal bowl from outside after pouring hot soup into it?
   - The bowl will feel so hot.
7. You touch a plastic bowl from outside after pouring hot soup into it?
   - The bowl will feel a bit warm.
8. You pick up a hot pot with a metal handle?
   - Heat will reach your hand causing burn.
9. We place three sensors along the length of the handle of a pot?
   - We will get three different temperatures in the three sensors.
10. Ice is left out of the fridge (concerning the state and mass)?
    - Ice melts and changes from a solid state to a liquid state.
    - The mass of ice doesn't change.
11. You heat a chocolate bar (concerning the state and mass)?
    - The chocolate bar melts and changes from a solid state to a liquid state.
    - The mass of the chocolate doesn't change.
12. You pick up a hot pot with its metallic handle?
    - You will feel its heat because the metallic handle is a conductor of heat.

13 You place 30 grams of juice in a freezer for a while (concerning the chang in its mass)?

- Its mass will not change.

14 The concrete is weak?

- It will not be used as the base of buildings and bridges.

15 You apply heat to plastic?

- It will shrink.

7 Revision on Concept 2

1 Choose the correct answer:

1 Heat is a form of ..... .
a. energy b. matter c. physical state d. metals

2 When matter becomes cooler, the ..... energy of the molecules decreases.
a. light b. kinetic c. magnetic d. electrical

3 All the following are from the ways of heat transfer, except ..... .
a. conduction b. condensation c. convection d. radiation

4 ..... is the transfer of heat due to the movement of a liquid or gas molecules.
a. Conduction b. Radiation c. Convection d. Freezing

5 If the mass of a piece of ice is 50 gm, its mass when it melts is ..... gm.
a. 50 b. 25 c. 40 d. 60

6 Glass is made from all the following, except ..... .
a. sand b. limestone c. soda ash d. iron

7 Molecules of ..... move very little.
a. water b. air c. rocks d. steam

8 Heat is often measured in units called ..... .
a. grams b. calories c. liters d. meters

9 Heat transfers from one tip of a metallic spoon to the other tip by ..... .
a. conduction b. condensation c. convection d. radiation

10 Heat transfers by convection between the molecules of all the following, except ..... .
a. water b. iron c. atmosphere d. mercury

11 It is better to use ..... for making handles.
a. copper b. steel c. iron d. plastic

12 ..... is made from chemical changes to some of the petroleum compounds.

a. Plastic b. Steel c. Glass d. Concrete

13 When the Sun heats up a rock, its particles will ..... .

a. slow down b. speed up c. stop moving d. lose energy

14 ..... is the condition where two objects exchange no heat as they have the same temperature.

a. Thermal energy b. Thermal equilibrium

c. Chemical equilibrium d. Heat transfer

15 If an engineer wanted to design a product that would conduct heat well, which material would he choose?

a. Wood b. Plastic c. Metal d. Foam

2 Put (✓) or (✗):

1 On ironing your wrinkled clothes, heat transfers from the clothes to the iron. ( )

2 Temperature is the energy that flows from one substance to another. ( )

3 Wood is considered an insulator, while metals are thermal conductors. ( )

4 The cold water molecules are denser (heavier) than those of hot water. ( )

5 It is safe to hold a metallic handle of a hot pot. ( )

6 Plastic is a tough solid that cannot resist heat. ( )

7 All objects even cold ones have thermal energy. ( )

8 To design cooler, shadier sidewalks, engineers must study convection only. ( )

3 Write the scientific term:

1 It is the transfer of thermal energy from a high-temperature object to a low-temperature object.

2 It's a condition under which there's no flow of thermal energy between two substances.

3 They are substances that allow heat to transfer through easily.
4 It is the transfer of heat through space or air.
5 They are specialists that predict weather.
6 They're types of clothes made up of a flexible fabric that retains the body heat.

4 Complete the following sentences using the words between the brackets:

(colder - solid - length of contact - hotter - surface area - contraction)

1 Heat transfers from a ..... object to a ..... one.
2 The rate of heat transfer increases by increasing the ..... and ..... .
3 The heat transfers through ..... substances by conduction.

5 Cross the odd word out:

Cloth - Iron - Plastic - Wood

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 A warm object	a. need to study convection to design new cookware.
2 Final temperature	b. slow down the heat transfer through them.
3 Engineers	c. loses energy if it gets in contact with a colder object.
4 Insulators	d. is slightly lower than the average temperature on mixing two liquids.

1 ..... 2 ..... 3 ..... 4 .....

7 Look at the following figures:

A Write the suitable way(s) of heat transfer in the following cases:

			
1	2	3	4 .....

B 1 If we melt a bar of chocolate, its ..... will change.

2 If the mass of the chocolate bar is 120 g, its mass when we melt it is ..... g.

8 Give reasons for:

1 A metal doorknob may feel cooler than the wooden door.

.....

2 Boiling water placed in a beaker on a table gets cooler after a while.

.....

9 What happens if:

1 The matter becomes warmer (concerning the atoms' kinetic energy)?

.....

2 You put your hand near a fireplace?

.....

Revision Model Answers

Unit 1

Concept 1

1

1 d	2 b	3 b	4 d
5 a	6 b	7 c	8 c
9 d	10 d	11 b	12 b
13 d	14 a	15 a	16 a
17 b	18 d	19 c	20 a

2

1 ✓	2 ✗	3 ✗	4 ✓
5 ✗	6 ✗	7 ✗	8 ✗
9 ✗	10 ✓	11 ✓	12 ✗
13 ✗	14 ✓	15 ✗	16 ✗

3

1 Cells
2 Multicellular organisms
3 Compound microscope
4 Distilled water
5 Organ
6 System
7 Nucleus
8 Cytoplasm
9 Mitochondria
10 Cellular respiration
11 Vacuole
12 Chloroplasts
13 Cell biologist
14 Methylene blue
15 Cancer

4

(A)
1 Mitochondria, chloroplasts
2 Bones, exoskeleton
3 pigment chlorophyll
4 cell wall, cell membrane

(B)
1 Golgi apparatus, endoplasmic reticulum
2 sugar, energy
3 3D microscopes
4 Nucleus

5

1 Cell wall
2 Blood cell
3 Bacteria

6

(A) 1 d 2 a 3 b 4 e 5 c

(B) 1 b 2 d 3 c 4 a

7

Figure (A)

1 compound microscope
2 **a.** Eye piece
b. Objective lens
c. Illuminator

Figure (B)

1 Animal cell
2 **a.** Nucleus
b. Cell membrane
c. Mitochondria
d. Golgi apparatus
3 **a:** Controls the cell functions and cell division.
c: Converts sugar into energy.

Figure (C):

1 plant cell
2 **a.** nucleus **b.** vacuole
c. chloroplasts **d.** cell wall
3 **b:** Store nutrients, water and wastes.
c: Carry out photosynthesis process.

8

1 Because it directs all the activities of the cell, such as cell division and producing protein
2 Because it consists of a group of similar tissues that perform a specific function.
3 Because the plant cell is surrounded by a cell wall from the outside.
4 Because they power the cell with energy.

5 Because animal cells don't have chloroplasts.
6 Because they make sugar from sunlight by the photosynthesis process.

9
1 The cell can't perform its activities properly.
2 Materials can't be packaged or transported inside or outside the cell.
3 The cell will swell and burst.

Concept ❷

1

1 b	2 b	3 c	4 d
5 d	6 d	7 b	8 d
9 c	10 b	11 d	12 b
13 b	14 a	15 c	16 c
17 a	18 b	19 b	

2

1 ✓	2 ✗	3 ✗	4 ✓
5 ✗	6 ✓	7 ✗	8 ✗
9 ✓	10 ✗	11 ✗	12 ✓
13 ✓	14 ✗	15 ✗	16 ✓

3
1 Skeletal muscles
2 System
3 Excretion process
4 Saliva
5 Excretory system
6 Muscle 7 Brain
8 Involuntary muscles
9 Small intestine
10 Respiratory system
11 Rectum 12 Artery
13 Jaw's muscles
14 Musculoskeletal system

4
(A) 1 blood, cells 2 water
3 sugar
4 brain, stamina
(B) 1 tendons, bones
2 hormones, endocrine system
3 diaphragm
(C) 1 nutrients, force
2 sympathetic nervous, adrenal glands
3 blood, kidney

5
1 Kidney 2 Heart
3 Skin

6
(A) 1 c 2 a 3 d 4 b
(B) 1 d 2 a 3 b 4 c

7
1 To power muscles with oxygen and nutrients needed to move faster.
2 To store and use energy when it is needed.
3 Because it pumps the blood automatically without any rest.
4 Because the heart beats faster and pumps more blood into the body.
5 Because they filter the blood from dissolved wastes.

8
1 Your heartrate and blood pressure speed up, and you start to perspire.
2 The sugar level will increase in the blood causing serious problems.
3 The dissolved wastes will stay in blood making the person sick.
4 Carbon dioxide is pushed outside the body.
5 Waste materials can't leave the body in the form of sweat.

9 1 The digestive system
2 a. Mouth b. Esophagus
c. Stomach d. Pancreas
e. Small intestine
f. Large intestine
3 The part is (d)

Concept ③

1

1 b	2 a	3 c	4 c
5 b	6 d	7 a	8 d
9 d	10 d	11 b	12 a
13 c	14 d	15 b	16 a
17 a	18 c	19 b	

2

1 ✓	2 ✗	3 ✓	4 ✗
5 ✓	6 ✓	7 ✗	8 ✓
9 ✗	10 ✗	11 ✓	12 ✗
13 ✓	14 ✓	15 ✗	16 ✗

3
1 Electric shock
2 Magnetic materials
3 Power plant 4 Electric circuit
5 Thermostat 6 Electrons
7 Generator
8 Parallel circuit 9 Galvanometer
10 Artificial pacemaker
11 Electric conductors
12 The needle
13 Magnetic force 14 Insulators
15 Electric current

4
(A) 1 parallel
2 steam, turbines
3 series 4 heartbeats
5 magnetic field
(B) 1 huge magnets, electric charges
2 work 3 plastic, hands

5
1 silver ware 2 iron
3 cloth

6
(A) 1 c 2 a 3 b
(B) 1 d 2 c 3 a 4 b

7

Electric conductors	Electric insulators
Copper - silver necklace - aluminum - iron - human body	Plastic - rubber - cloth - wood

8
(A) 1 b, The light bulb is turned on.
2 The light bulb will is turned off.
(B) 1 Magnet
2 Needle of galvanometer
3 Electromagnetic

9
1 Because water is a good conductor of electricity.
2 Because there's a break in the circuit that makes it uncompleted loop.
3 Because the electric current flows in one path.
4 To limit the damage to the components of a circuit.
5 Due to the gravitational force of Earth.
6 Because an electric current in induced.

10
1 Steel pins will be attracted to the magnet.
2 It will not generate electricity.
3 He may die.
4 The rest of the bulbs will be turned off.
5 It will induce electric current.
6 The needle of the galvanometer moves faster, indicating an increase in the voltage.

Unit 2

Concept 1

1

1 d	2 b	3 c	4 b
5 a	6 b	7 b	8 d
9 c	10 c	11 d	12 a
13 a	14 c	15 a	16 b
17 d	18 b	19 d	20 b

2

1 ✓	2 ✓	3 ✗	4 ✗
5 ✗	6 ✗	7 ✓	8 ✓
9 ✗	10 ✗	11 ✗	12 ✓
13 ✗			

3

1 Thermometer 2 Temperature
3 Melting 4 Melting point
5 Thermal expansion
6 Thermal contraction
7 Expansion joints 8 Temperature
9 Thermal energy
10 Volume 11 Freezing
12 Evaporation 13 Thermometer

4

(A) 1 hot, cold 2 less, slower
3 particles 4 contraction

(B) 1 heat energy , kinetic energy
2 liquid, gas, spread out
3 expand, contract

5 1 Condensation 2 Steam

6 1 b 2 d 3 c 4 a

7

1 To avoid thermal expansion hazards.
2 Because its particles get more energy and spread out so far apart.
3 Because its particles have more thermal energy.
4 Because heat energy transfers from your hand to the ice.

8

1 It changes from solid into liquid state.
2 They will spread out in water with the same rate.
3 The liquid inside it expands and rise up.

Concept 2

1

1 a	2 b	3 b	4 c
5 a	6 d	7 c	8 b
9 a	10 b	11 d	12 a
13 b	14 b	15 c	

2

1 ✗	2 ✗	3 ✓	4 ✓
5 ✗	6 ✗	7 ✓	8 ✗

3

1 Heat transfer
2 Thermal equilibrium
3 Thermal conductors
4 Radiation
5 Meteorologists
6 Smart clothes

4

1 hotter, colder
2 surface area, length of contact
3 solid

5 1 Iron

6 1 c 2 d 3 a 4 b

7

(A) 1 Radiation 2 Conduction
3 Convection and Radiation
4 Radiation and Convection

(B) 1 state 2 120 gm

8

1 Because the metal doorknob is a thermal conductor, while the wooden door is an insulator.
2 Because the heat transfers from the hot water to the surrounding air.

9

1 The kinetic energy of the atoms will increase.
2 You will feel warm as the heat transfers to your hand by radiation.

First term Questions Bank المتميز

Question 01 Choose the correct answers

1. Nutrients and oxygen enter cell through the .....
   (a) cell membrane (b) mitochondria (c) Chloroplast (d) nucleus
2. Which of the following structures is found in both plant and animal cells?
   (a) Cell membrane (b) Cell wall (c) Large vacuole (d) Chloroplast
3. The control center of the cell and is responsible for cell division .....
   (a) mitochondria (b) nucleus (c) golgi apparatus (d) chloroplast
4. Which of the following is found in an acacia plant leaf and is not found in human?
   (a) Cell wall (b) Mitochondria (c) Cell membrane (d) Cytoplasm
5. We can see the cell of ..... without using a microscope.
   (a) bacteria (b) plant (c) human (d) birds' egg
6. Most plants appear in .....color due to the presence of chlorophyll pigment in their cells
   (a) yellow (b) red (c) blue (d) green
7. The animal cell cannot make photosynthesis process, because it doesn't have.....
   (a) nucleus (b) chloroplasts (c) mitochondria (d) sap vacuole
8. The body of ..... composed of one cell only.
   (a) human (b) bacteria (c) a big tree (d) an elephant
9. The smallest tiny structures that build up all living organism's bodies are.....
   (a) systems (b) cells (c) organs (d) bricks
10. When two muscles work together to carry out a movement one muscle ..... while the other .....
    (a) moves - stays still (b) contracts - relaxes (c) stays still - relaxes (d) stays still - contracts

11 Diabetes is a disorder of the endocrine system. In people with diabetes, the ..... does not produce enough insulin.

(a) gallbladder (b) thyroid gland (c) pancreas (d) small intestine

12 All the following animals have bones in their bodies, except.....

(a) cats (b) dogs (c) birds (d) insects

13 The systems of the human body get their needed energy from.....

(a) the Sun (b) water (c) food (d) carbon dioxide

14 Urination process happens by the help of..... system.

(a) digestive (b) urinary (c) respiratory (d) skeletal

15 Stomach is composed of a group of different.....

(a) cells (b) systems (c) organs (d) tissues

16 Skeletal system takes nutrients from..... system for growth of muscles

(a) circulatory (b) digestive (c) nervous (d) respiratory

17 In a dangerous situation, your eyes send the information to the..... perform the suitable action.

(a) brain (b) stomach (c) lungs (d) heart

18 Engineers design special devices to work instead of..... organ which filter the blood from waste materials

(a) stomach (b) heart (c) kidney (d) lung

19 The factors on which gravitational force depends are .....

(a) mass and shape (b) size and shape (c) mass and volume (d) distance and mass

20 The electrical insulating materials include .....

(a) rubber (b) iron (c) copper (d) aluminum

21 When a piece of aluminum is replaced by a piece of wood in an electrical circuit, this causes .....

(a) current flow (b) open the circuit (c) close the circuit (d) lighting the lamp

22 The ..... of objects and the.....between them affect the gravity force.

(a) mass – color (b) distance - mass (c) mass – distance (d) volume - distance

23 The internal switch on a ..... can be used in the refrigerator to adjust its temperature

(a) battery (b) light bulb (c) thermostat (d) wall socket

24 .....is used to slow the flow of an electric current in the electric circuit

(a) A battery (b) A switch (c) A resistor (d) A lamp

25 Magnets can be made of.....

(a) copper (b) glass (c) iron (d) plastic

26 Heat will flow from the ..... substance to the ..... one.

(a) hotter - colder (b) frozen - melted (c) colder - hotter (d) larger - smaller

27 The temperature of a substance is defined as the average amount of ..... of the molecules or other particles of a sample of matter.

(a) potential energy (b) mass (c) kinetic energy (d) number

28 Objects with more thermal energy have ..... kinetic energy.

(a) more (b) less (c) the same (d) no

29 ..... happens as a result of the separation of the particles of a substance when heat is transferred to it.

(a) Contraction (b) Expansion (c) Growth (d) Freezing point

30 Raising the temperature of materials can cause .....

(a) freezing and expansion (b) condensation and contraction (c) melting and expansion (d) melting and contraction

31 The point at which molecules in liquid water are heated and separated from each other until they become gas, is called .....

(a) melting point (b) freezing point (c) boiling point (d) kinetic energy

32 Which energy is generated due to the motion of particles in a certain substance?

(a) Thermal energy (b) Muscular energy (c) Momentary energy (d) Potential energy

33 Matter in the liquid state has ..... volume and ..... shape.

(a) fixed - fixed (b) variable - fixed (c) variable - variable (d) fixed - variable

34 ..... is used to measure the temperature of materials.

(a) Measuring container (b) Graduated cylinder (c) Thermometer (d) Measuring tape

35 The ..... energy is related to the motion of particles of matter

(a) chemical (b) potential (c) light (d) thermal

36 Particles of all the following substances have a lot of energy, except .....

(a) oxygen (b) carbon dioxide (c) water vapor (d) glass

37 Changing from gas to liquid is called.....

(a) melting (b) condensation (c) evaporation (d) freezing

38 Materials..... by heating.

(a) expand (b) contract (c) compress (d) do not change

39 The molecule is composed of very small particles called .....

(a) compounds (b) cells (c) atoms (d) mixtures

40 All of these substances are solids, except.....

(a) oil (b) snow (c) pen (d) iron

41 If you want to design a product which conducts heat well which material will you think of?

(a) Wood (b) Plastic (c) Foam (d) Metal

42 ..... is the transfer of heat due to the movement of a liquid or gas.

(a) Radiation (b) Conduction (c) Freezing (d) Convection

43 Which of the following may not be a source of thermal energy?

(a) Small oven (b) The Sun (c) Moon (d) The heater

44 Heat is transferred by convection in the molecules of the following substances, except .....

(a) milk (b) water (c) air (d) iron

45 Sunlight and the heat of the Sun reach Earth by .....

(a) conduction (b) radiation (c) convection (d) a, c

46 Heat is transferred through solids by.....

(a) radiation only (b) conduction and convection (c) conduction only (d) radiation and convection

47 Meteorologists are scientists who study .....

(a) weather (b) rocks (c) water (d) space

48 To make clothes we can use.....

(a) steel (b) concrete (c) hard fabric (d) flexible fabric

49 Railroad tracks are made up of .....

(a) iron (b) plastic (c) coal (d) glass

50 All the following are properties of steel, except .....

(a) it is a mixture of rock and sand (b) it is a mixture of iron and other elements.

(c) it is strong material. (d) it lasts for a long time

Question 02 put (true) or (false)

1 All cells are formed of organelles, each of which performs a different function. ( )

2 Tissue consists of a group of similar cells. ( )

3 Water and wastes are stored in the vacuole. ( )

4 Plant cells and animal cells are completely similar in structure. ( )

5 All living cells contain chloroplasts. ( )

6 Chloroplasts are found in the cells of banana plant leaves. ( )

7 Bacteria and horse are considered as multicellular organisms. ( )

8 Cell biologists are scientists who study rocks. ( )

9 The brain does not respond when feeling stressed. ( )

10 Every system in the body works individually when exposed to danger. ( )

11 Sweat is excreted by the lungs. ( )

12 The skin takes part in expelling sweat through the pores. ( )

13 The muscles of the body work together at the same time ( )

14 A human can control the movement of blood in his body. ( )

15 Muscle cells are short Fibers that allow movement, storage and release of energy. ( )

16 Heat is transferred from a substance of low temperature to a substance of higher temperature. ( )

17. If your body doesn't get rid of waste, you will be healthy. ( )
18. Diabetes disease is one of the disorders of the respiratory system. ( )
19. Muscle cells cannot store and use energy quickly. ( )
20. The heart is important in our body as it helps in food digestion. ( )
21. Exoskeleton gives some insects their shapes. ( )
22. All systems in your body work together in an integrated way. ( )
23. Cobalt is an example of magnetic materials. ( )
24. In series circuits, the electric current can flow in different branches. ( )
25. All materials can be attracted to the magnet ( )
26. If we remove a lamp from the circuit in figure (A), the other lamp still light ( )
27. The magnet has a force called magnetism ( )
28. Magnets attract the non-magnetic materials such as iron, nickel and steel ( )
29. The needle of a galvanometer moves on moving a magnet in and out of a copper coil. ( )
30. When the thermal energy of the objects increases, the kinetic energy of its molecules increases too. ( )
31. Freezing is the transfer of heat due to the movement of a liquid or gaseous substance. ( )
32. Matter in the liquid state has a fixed volume and a variable shape ( )
33. Measuring container is used to measure the temperature of materials. ( )
34. We can measure the temperature by using thermometers. ( )
35. Matter can't be changed from one form to another. ( )
36. Expansion and contraction are two opposite processes. ( )
37. Thermal conductors are good conductors of heat. ( )
38. Expansion and contraction of matter occur due to changes in temperature ( )
39. Molecules of cold or hot substances always move. ( )
40. No spaces are left between railroad tracks. ( )
41. Heat flows from a colder substance to a hotter substance. ( )

42 Thermal energy transfer can occur in only two ways. ( )

43 Sunlight and heat reaching Earth is an example of thermal radiation. ( )

44 The final temperature is greater than the temperature of two bodies in contact. ( )

45 Thermal energy is destroyed when it is transferred from one body to another. ( )

46 Thermal energy is transferred in metals by radiation ( )

47 The transfer of heat between two bodies stops when the temperature of each is the same. ( )

48 Metals such as copper and iron allow heat to travel freely through them. ( )

49 Plastic often resists burning. ( )

50 In electric iron heat transfers from cloth to iron. ( )

Question 03 Cross the odd word

1 Human - Fish - Plant - Bacteria.

2 Urine - Oxygen gas - Carbon dioxide - Sweat.

3 Plastic - Copper - Iron - Aluminium

4 Air – Copper – Wood - Glass

5 Oil - Milk - Iron - Vinegar.

6 Conduction - Convection - Friction - Radiation

Question 04 write the scientific term for each of the following

1 A device used to examine very small things. ( )

2 It is often located at the center of the cell. ( )

3 The are scientists who study cells. ( )

4 The component of cell that allows water to enter and exit the cell ( )

5 It surrounds the plant cell to give it a definite shape. ( )

6 A group of organs that work together to perform a specific function. ( )

7. A system that secretes hormones stimulating the rest of the body's systems to respond. ( )
8. The system which helps the body to move. ( )
9. The organ that controls the level of sugar in human body ( )
10. A hormone that controls the level of sugar in human body ( )
11. They are muscles that you can control their movement. ( )
12. A disease that is resulting from the disorder of secreting insulin hormone by pancreas. ( )
13. The pattern formed by iron filings near the magnet. ( )
14. Small electric charges moving in the wires in a closed electrical circuit. ( )
15. The materials that are attracted to the magnet. ( )
16. The materials that the electric charges can flow through. ( )
17. A form of energy produced from generators and turbines. ( )
18. The area around the magnet in which its force appears. ( )
19. It is a group of atoms bound together. ( )
20. The state of matter which changes into liquid state by heating. ( )
21. A device used to measure the temperature. ( )
22. A mixture of rock, sand and water which becomes hard after it dries. ( )
23. The mass of a substance doesn't change when this substance changes from one state into another. ( )
24. They are materials that slow down the heat transfer through them . ( )
25. It occurs when heat transfer stops between two objects reach the same temperature. ( )

Question 05 Give reason for each of the following

1. The cell allows water to go outside it.

.....

2. Cats are considered as multicellular organism

.....

3. Stomach secretes a digestive fluid when the food reaches it.

.....

4. Muscle cells are in the form of long Fibers

.....

5. The muscles that surround the eyeball are considered as voluntary muscles

.....

6. Cobalt and nickel are considered as magnetic materials.

.....

7. Particles of steam have higher thermal energy than particles of water.

.....

8. Engineers use expansion points in the designing of bridges.

.....

9. You feel heat, when you touch a metal spoon placed in a hot cup of tea.

.....

Question 06 What happens if ..... ?

1. The animal cell is surrounded by cell wall.

.....

2. There is much water enters the cell.

.....

3. The blood does not pass through the two kidneys during its circulation inside the human body.

.....

4. The lungs when the diaphragm muscle contracts.

.....

5. A magnet is approached close to some iron nails mixed with small pieces of paper.

.....

6. The force of gravity if the distance between the object and Earth's center increases.

.....

7. The size of an inflated balloon if it is put in hot weather.

.....

8. The level of alcohol inside a thermometer if we put it inside cold

.....

9. The mass of a piece of butter after melting it

.....

10. Molecules' movement of a hotter substance after mixing it with a cooler substance.

.....

	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5
Choose	1-9	10-18	19-25	26-40	41-50
Put right or wrong	1-8	9-22	23-29	30-41	42-50
Cross the odd word	1	2	3-4	5	6
Write s- term	1-5	6-12	3-18	19-20	21-25
Give reason	1-2	3-5	6	7-8	9
What happens	1-2	3-4	5-6	7-8	9-10

تم بحمد الله

بسم الله الرحمن الرحيم " إِنَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ إِنَّا لَا نُضِيعُ أَجْرَ مَنْ أَحْسَنَ عَمَلًا " صدق الله العظيم

Answers

Question 01 Choose the correct answers

1. Nutrients and oxygen enter cell through the .....
   (a) cell membrane (b) mitochondria (c) Chloroplast (d) nucleus
2. Which of the following structures is found in both plant and animal cells?
   (a) Cell membrane (b) Cell wall (c) Large vacuole (d) Chloroplast
3. The control center of the cell and is responsible for cell division .....
   (a) mitochondria (b) nucleus (c) golgi apparatus (d) chloroplast
4. Which of the following is found in an acacia plant leaf and is not found in human?
   (a) Cell wall (b) Mitochondria (c) Cell membrane (d) Cytoplasm
5. We can see the cell of ..... without using a microscope.
   (a) bacteria (b) plant (c) human (d) birds' egg
6. Most plants appear in .....color due to the presence of chlorophyll pigment in their cells
   (a) yellow (b) red (c) blue (d) green
7. The animal cell cannot make photosynthesis process, because it doesn't have.....
   (a) nucleus (b) chloroplasts (c) mitochondria (d) sap vacuole
8. The body of ..... composed of one cell only.
   (a) human (b) bacteria (c) a big tree (d) an elephant
9. The smallest tiny structures that build up all living organism's bodies are.....
   (a) systems (b) cells (c) organs (d) bricks
10. When two muscles work together to carry out a movement one muscle ..... while the other .....
    (a) moves - stays still (b) contracts - relaxes (c) stays still - relaxes (d) stays still - contracts
11. Diabetes is a disorder of the endocrine system. In people with diabetes, the ..... does not produce enough insulin.
    (a) gallbladder (b) thyroid gland (c) pancreas (d) small intestine

12 All the following animals have bones in their bodies, except.....

(a) cats (b) dogs (c) birds (d) insects

13 The systems of the human body get their needed energy from.....

(a) the Sun (b) water (c) food (d) carbon dioxide

14 Urination process happens by the help of..... system.

(a) digestive (b) urinary (c) respiratory (d) skeletal

15 Stomach is composed of a group of different.....

(a) cells (b) systems (c) organs (d) tissues

16 Skeletal system takes nutrients from..... system for growth of muscles

(a) circulatory (b) digestive (c) nervous (d) respiratory

17 In a dangerous situation, your eyes send the information to the..... perform the suitable action.

(a) brain (b) stomach (c) lungs (d) heart

18 Engineers design special devices to work instead of..... organ which filter the blood from waste materials

(a) stomach (b) heart (c) kidney (d) lung

19 The factors on which gravitational force depends are .....

(a) mass and shape (b) size and shape (c) mass and volume (d) distance and mass

20 The electrical insulating materials include .....

(a) rubber (b) iron (c) copper (d) aluminium

21 When a piece of aluminum is replaced by a piece of wood in an electrical circuit, this causes .....

(a) current flow (b) open the circuit (c) close the circuit (d) lighting the lamp

22 The ..... of objects and the.....between them affect the gravity force.

(a) mass – color (b) distance - mass (c) mass – distance (d) volume - distance

23 The internal switch on a ..... can be used in the refrigerator to adjust its temperature

(a) battery (b) light bulb (c) thermostat (d) wall socket

24 .....is used to slow the flow of an electric current in the electric circuit

(a) A battery (b) A switch (c) A resistor (d) A lamp

25 Magnets can be made of.....

(a) copper (b) glass (c) iron (d) plastic

26 Heat will flow from the ..... substance to the ..... one.

(a) hotter - colder (b) frozen - melted (c) colder - hotter (d) larger - smaller

27 The temperature of a substance is defined as the average amount of ..... of the molecules or other particles of a sample of matter.

(a) potential energy (b) mass (c) kinetic energy (d) number

28 Objects with more thermal energy have ..... kinetic energy.

(a) more (b) less (c) the same (d) no

29 ..... happens as a result of the separation of the particles of a substance when heat is transferred to it.

(a) Contraction (b) Expansion (c) Growth (d) Freezing point

30 Raising the temperature of materials can cause .....

(a) freezing and expansion (b) condensation and contraction (c) melting and expansion (d) melting and contraction

31 The point at which molecules in liquid water are heated and separated from each other until they become gas, is called .....

(a) melting point (b) freezing point (c) boiling point (d) kinetic energy

32 Which energy is generated due to the motion of particles in a certain substance?

(a) Thermal energy (b) Muscular energy (c) Momentary energy (d) Potential energy

33 Matter in the liquid state has ..... volume and ..... shape.

(a) fixed - fixed (b) variable - fixed (c) variable - variable (d) fixed - variable

34 ..... is used to measure the temperature of materials.

(a) Measuring container (b) Graduated cylinder (c) Thermometer (d) Measuring tape

35 The ..... energy is related to the motion of particles of matter

(a) chemical (b) potential (c) light (d) thermal

36 Particles of all the following substances have a lot of energy, except .....

(a) oxygen (b) carbon dioxide (c) water vapor (d) glass

37 Changing from gas to liquid is called.....

(a) melting (b) condensation (c) evaporation (d) freezing

38 Materials..... by heating.

(a) expand (b) contract (c) compress (d) do not change

39 The molecule is composed of very small particles called .....

(a) compounds (b) cells (c) atoms (d) mixtures

40 All of these substances are solids, except.....

(a) oil (b) snow (c) pen (d) iron

41 If you want to design a product which conducts heat well which material will you think of?

(a) Wood (b) Plastic (c) Foam (d) Metal

42 ..... is the transfer of heat due to the movement of a liquid or gas.

(a) Radiation (b) Conduction (c) Freezing (d) Convection

43 Which of the following may not be a source of thermal energy?

(a) Small oven (b) The Sun (c) Moon (d) The heater

44 Heat is transferred by convection in the molecules of the following substances, except .....

(a) milk (b) water (c) air (d) iron

45 Sunlight and the heat of the Sun reach Earth by .....

(a) conduction (b) radiation (c) convection (d) a, c

46 Heat is transferred through solids by.....

(a) radiation only (b) conduction and convection (c) conduction only (d) radiation and convection

47 Meteorologists are scientists who study .....

(a) weather (b) rocks (c) water (d) space

48 To make clothes we can use.....

(a) steel (b) concrete (c) hard fabric (d) flexible fabric

49 Railroad tracks are made up of .....

(a) iron (b) plastic (c) coal (d) glass

50 All the following are properties of steel, except .....

(a) it is a mixture of rock and sand (b) it is a mixture of iron and other elements.

(c) it is strong material. (d) it lasts for a long time

Question 02 put (true) or (false)

1 All cells are formed of organelles, each of which performs a different function. ✓

2 Tissue consists of a group of similar cells. ✓

3 Water and wastes are stored in the vacuole. ✓

4 Plant cells and animal cells are completely similar in structure. ✗

5 All living cells contain chloroplasts. ✗

6 Chloroplasts are found in the cells of banana plant leaves. ✓

7 Bacteria and horse are considered as multicellular organisms. ✗

8 Cell biologists are scientists who study rocks. ✗

9 The brain does not respond when feeling stressed. ✗

10 Every system in the body works individually when exposed to danger. ✗

11 Sweat is excreted by the lungs. ✗

12 The skin takes part in expelling sweat through the pores. ✓

13 The muscles of the body work together at the same time ✗

14 A human can control the movement of blood in his body. ✗

15 Muscle cells are short Fibers that allow movement, storage and release of energy. ✗

16 Heat is transferred from a substance of low temperature to a substance of higher temperature. ✗

17 If your body doesn't get rid of waste, you will be healthy. ✗

18 Diabetes disease is one of the disorders of the respiratory system. ✗

19. Muscle cells cannot store and use energy quickly. ✗
20. The heart is important in our body as it helps in food digestion. ✗
21. Exoskeleton gives some insects their shapes. ✓
22. All systems in your body work together in an integrated way. ✓
23. Cobalt is an example of magnetic materials. ✓
24. In series circuits, the electric current can flow in different branches. ✗
25. All materials can be attracted to the magnet ✗
26. If we remove a lamp from the circuit in figure (A), the other lamp still light ✓
27. The magnet has a force called magnetism ✓
28. Magnets attract the non-magnetic materials such as iron, nickel and steel ✗
29. The needle of a galvanometer moves on moving a magnet in and out of a copper coil. ✓
30. When the thermal energy of the objects increases, the kinetic energy of its molecules increases too. ✓
31. Freezing is the transfer of heat due to the movement of a liquid or gaseous substance. ✗
32. Matter in the liquid state has a fixed volume and a variable shape ✓
33. Measuring container is used to measure the temperature of materials. ✗
34. We can measure the temperature by using thermometers. ✓
35. Matter can't be changed from one form to another. ✗
36. Expansion and contraction are two opposite processes. ✓
37. Thermal conductors are good conductors of heat. ✓
38. Expansion and contraction of matter occur due to changes in temperature ✓
39. Molecules of cold or hot substances always move. ✓
40. No spaces are left between railroad tracks. ✗
41. Heat flows from a colder substance to a hotter substance. ✗
42. Thermal energy transfer can occur in only two ways. ✗

43. Sunlight and heat reaching Earth is an example of thermal radiation. ✓
44. The final temperature is greater than the temperature of two bodies in contact. ✗
45. Thermal energy is destroyed when it is transferred from one body to another. ✗
46. Thermal energy is transferred in metals by radiation ✗
47. The transfer of heat between two bodies stops when the temperature of each is the same. ✓
48. Metals such as copper and iron allow heat to travel freely through them. ✓
49. Plastic often resists burning. ✓
50. In electric iron heat transfers from cloth to iron. ✗

Question 03 Cross the odd word

1. Human - Fish - Plant - Bacteria. — bacteria
2. Urine - Oxygen gas - Carbon dioxide - Sweat. — oxygen gas
3. Plastic - Copper - Iron - Aluminium — plastic
4. Air – Copper – Wood - Glass — copper
5. Oil - Milk - Iron - Vinegar. — iron
6. Conduction - Convection - Friction - Radiation — friction

Question 04 write the scientific term for each of the following

1. A device used to examine very small things. — microscope
2. It is often located at the center of the cell. — Nucleus
3. The are scientists who study cells. — Cell biologists
4. The component of cell that allows water to enter and exit the cell — cell membrane
5. It surrounds the plant cell to give it a definite shape. — cell wall
6. A group of organs that work together to perform a specific function. — System
7. A system that secretes hormones stimulating the rest of the body's systems to respond. — Endocrine system

8	The system which helps the body to move.	Musculoskeletal System
9	The organ that controls the level of sugar in human body	Pancreas
10	A hormone that controls the level of sugar in human body	insulin hormone
11	They are muscles that you can control their movement.	voluntary muscles
12	A disease that is resulting from the disorder of secreting insulin hormone by pancreas.	Diabetes
13	The pattern formed by iron filings near the magnet.	Magnetic field
14	Small electric charges moving in the wires in a closed electrical circuit.	Electric current
15	The materials that are attracted to the magnet.	magnetic materials
16	The materials that the electric charges can flow through.	electric conductors
17	A form of energy produced from generators and turbines.	electricity
18	The area around the magnet in which its force appears.	Magnetic field
19	It is a group of atoms bound together.	Molecule
20	The state of matter which changes into liquid state by heating.	Solid
21	A device used to measure the temperature.	Thermometer
22	A mixture of rock, sand and water which becomes hard after it dries.	Concrete
23	The mass of a substance doesn't change when this substance changes from one state into another.	the law of conservation of mass
24	They are materials that slow down the heat transfer through them	thermal insulator
25	It occurs when heat transfer stops between two objects reach the same temperature.	Thermal equilibrium

Question 05 — Give reason for each of the following

1. The cell allows water to go outside it.
   To keep water balance on both sides of the cell membrane
2. Cats are considered as multicellular organism
   Because the bodies of cats consist of many cells
3. Stomach secretes a digestive fluid when the food reaches it.
   To allow more food break down

4. Muscle cells are in the form of long Fibers

To allow the movement

5. The muscles that surround the eyeball are considered as voluntary muscles

Because you can control the movement of eyeball muscles

6. Cobalt and nickel are considered as magnetic materials.

Because they are attracted to the magnet

7. Particles of steam have higher thermal energy than particles of water.

Because particles of steam move faster than particles of water

8. Engineers use expansion points in the designing of bridges.

To keep the bridge safe from buckling when they expend at high temperatures

9. You feel heat, when you touch a metal spoon placed in a hot cup of tea.

Because the metal spoon is a thermal conductor material that allow heat to transfer through it

Question 06 What happens if ..... ?

1. The animal cell is surrounded by cell wall.

The animal cell will have definite shape

2. There is much water enters the cell.

The cell will swell until it bursts

3. The blood does not pass through the two kidneys during its circulation inside the human body.

The blood will not be filtered from the waste materials and the body get sick

4. The lungs when the diaphragm muscle contracts.

The lungs take in the air rich in oxygen gas

5. A magnet is approached close to some iron nails mixed with small pieces of paper.

The magnet will not attract the iron nails but it will not attract the small pieces of paper

6. The force of gravity if the distance between the object and Earth's center increases.

The force of gravity between them decreases

7. The size of an inflated balloon if it is put in hot weather.
   Its size will increase
8. The level of alcohol inside a thermometer if we put it inside cold
   the alcohol will go down
9. The mass of a piece of butter after melting it
   The mass does not change
10. Molecules' movement of a hotter substance after mixing it with a cooler substance.
    Molecules of hotter substance will move slower after mixing

	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5
Choose	1-9	10-18	19-25	26-40	41-50
Put right or wrong	1-8	9-22	23-29	30-41	42-50
Cross the odd word	1	2	3-4	5	6
Write s- term	1-5	6-12	3-18	19-20	21-25
Give reason	1-2	3-5	6	7-8	9
What happens	1-2	3-4	5-6	7-8	9-10

تم بحمد الله

بسم الله الرحمن الرحيم " إِنَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ إِنَّا لَا نُضِيعُ أَجْرَ مَنْ أَحْسَنَ عَمَلًا " صدق الله العظيم

Give Reason

1- The cell needs energy
To carry out all its life activities and survive

2- The cell allows water to go outside it
To keep the water balance on both sides of the cell membrane

3- You cannot see the body of a bacteria with your naked eye
Because it consists of only one cell that cannot be seen by naked eyes

4- Scientists tend to use microscope in their research
to discover more information about the cell and exchange these information

5- We must rotate the coarse focus and fine focus during examining a sample under microscope
To see a clear image for the sample under the microscope

6- Cats are considered as multicellular organisms
Because their bodies consist of many cells

7- Plant cells can make photosynthesis process
Because they have chloroplasts on plant cells

8- Both of endoplasmic reticulum and Golgi apparatus are involved in transportation process inside and outside the cell
Because endoplasmic reticulum transports protein inside the cell and Golgi apparatus transports different materials between the cells and out of the cell

9- Plant cells have a definite shape
Because the plant cell is surrounded by cell wall which gives it the definite shape

10- Chlorophyll absorbs the energy of the sunlight
To make the food of the plant through the photosynthesis process

11- Mitochondria act as electric power stations in cities
Because they provide the cell with its needed energy

12- Vacuoles act as storehouses in cities
Because they store nutrients, water, and waste materials

13- Some cell biologists work with doctors

To watch how cells can work to repair body parts or how cells respond to different medicines

14- We must stain cells before examining them under microscope
Because cells are usually clear and colorless, so it is hard to see them under microscope

15- Digestive system helps skeletal system in fracture healing
Because it provides the skeletal system with nutrients needed for fracture healing

16- The nerve cells in the nervous system need nutrients
To perform their functions

17- The importance of nervous system for the muscles of heart
Because it controls the movements of heart muscles

18- Muscle cells are in the form of long fibers
To allow movement

19- Muscle cells don't work alone

Because the size of the muscle cell is very small

20- Skeletal system cannot do the function of movement without muscular system

Because skeletal muscles that is attached to bones of skeletal system allow bones to move

21- Cardiac muscles are considered as involuntary muscles

Because they move automatically, and you cannot control their movement

22- Cardiac muscles contract and relax without stopping

To allow the heart pumps the blood carrying oxygen to all the body cells

23- The muscles that surround the eyeball are considered voluntary muscles

Because you can control the movement of the eyeball muscles

24- When the body faces a danger, the heartbeats increase

Because endocrine system secretes hormones which cause increasing of heartbeats rate to face danger

25- The body needs to convert complex food into simpler substances

Because the body cells need these simpler structures to get energy and grow

26- Saliva plays an important role in digestion of food inside the mouth

Because saliva softens the food and start breaking down it

27- Stomach secretes a digestive fluid when the food reaches it
To allow more food breakdown

28- Walls of small intestine contain blood vessels
To carry the nutrients to all body parts

29- Undigested food becomes solid mass inside the large intestine
Because the large intestine absorbs most of water from the undigested food

30- The liver and muscles convert the stored glycogen into glucose sugar
To provide the body with its needed energy

31- Importance of excretion process to your body
It collects the waste materials produced by the cells and removes them from the body to keep it healthy

32- The digestive system does not share in excretion process
Because it does not work on the waste materials produced from burning food inside the body cells

33- The two kidneys contain many nephrons
To filter the blood and remove harmful substances from the body

34- Formation of urea inside the human body
Due to the break down proteins inside the body cells

35- Blood cells and proteins cannot pass through the kidney's nephrons
Because blood cells and proteins are large

36- Diabetic must give themselves regular shots of insulin
To regulate the sugar level in blood

37- The electric circuit is considered as a system
Because it is a path for electricity that consists of many components work together as one system

38- When a ball is thrown into the air, it will stop moving upward and then falls down
Due to the Earth's gravity

39- Cobalt and nickel are considered as magnetic materials
Because they are attracted to the magnet

40- Wood and copper are not attracted to the magnet
Because they are non-magnetic materials

41- Electric generators have great importance in our life
Because they are used in lighting houses and operating electrical devices

42- The electric circuit must contain a battery
Because it is the source of electricity

43- All metals are considered as electric conductors
Because they allow the flow of electric current easily

44- Most electric wires are covered with rubber or plastic
Because they are bad conductors of electricity to protect people from electric shock

45- Electric wires are made of copper
Because it is a good conductor of electricity

46- Electric wires are wrapped in plastic
Because plastic is a bad conductor of electricity and prevent people from electric shock

47- Some electric circuits contain resistors

To slow the flow of electrons through the electric circuit to prevent its components from damage

48- In the parallel circuit, we can turn off or remove one light bulb while the other light bulbs will remain lit

Because in parallel circuit, the electric current flows along different branches

49- When a magnet is moved rapidly back and forth inside a coil, the needle of the galvanometer connected to the coil moves rapidly

Because electric current is produced

50- Scientists provide the new artificial pacemaker by a built-in antenna

To send information to physicians, so they know how the heart is behaving

51- The heart has a natural pacemaker

To create electrical currents causing the heart to contract

52- Particles of steam have higher thermal energy than particles of water

Because particles of steam move faster than particles of water

53- Ice melts when it is put in a hot cooking pan

Because heat flow from the hotter substance (pan) to the colder substance (ice)

54- Matter may change from one state to another

Because the thermal energy of a matter may change causing a change in the state of matter

55- Evaporation and condensation are two opposite processes
Because a matter changes from liquid state into gas state in evaporation while it changes from gas state to liquid state in condensation

56- Food coloring takes less time to spread out in the hot water than in cold water
Because hot water has more thermal energy, so its molecules have more kinetic energy and move faster

57- Engineers use expansion points in the designing of bridges
To keep bridges safe from buckling when they expand at high temperatures

58- The level of alcohol inside a thermometer rises up if we put it inside hot water and goes down if we put it inside cold water
Because alcohol expands by heating and contracts by cooling

59- Pouring hot water over a metal lid of a glass jar makes it easier to open the jar
Because when the temperature of the metal lid increases, it expands and can be easily opened

60- Matter expands when its thermal energy increases
Because kinetic energy of molecules increases and the spaces between them increases causing its expansion

61- The size of a ballon decreases if it is subjected to cold weather
Because the air inside it contracts by cooling

62- Small spaces are left between the railroad tracks
To allow the tracks to expand in hot weather without being bent to avoid train accidents

63- The handle of an electric iron is made of plastic
Because plastic is a thermal insulator than does not allow heat to transfer

64- The lower part of an electric iron is made of iron
Because iron is a thermal conductor that allows heat to transfer

65- You feel heat when you touch a metal spoon placed in a hot cup of tea
Because the temperature of the metal spoon is higher than the hand so the heat transfers from the metal spoon to the hand

66- Sometimes the final temperature of a mixture of two substances with different temperatures is less than their average temperature
Because some of the thermal energy transfers to the air or the container

67- Heat transfer stops after a while between two mixed substances with different temperatures
Because they reach the same temperature at thermal equilibrium

68- After mixing two substances with different temperatures, the molecules of the hotter substance move slower
Because the molecules temperature of hotter substance decreases

69- The vibration of molecules of a matter increases when it becomes warmer
Because when a matter becomes warmer, the kinetic energy of its molecules increases so their vibration increases

70- You feel the heat of the sun although there is a space between the sun and Earth
Because heat transfer through the space by radiation

71- Aluminum and copper are good conductors of heat
Because they allow heat to travel freely through them

72- Glass and wood are bad conductors of heat
Because they slow down the transfer of heat

73- The mass of ice cubes before melting equals to their mass after melting
According to the law of conservation of mass, the mass of ice cubes does not change when ice changes from solid state to liquid state

74- Decreasing of mass of popcorn grains which have some moisture after cooking them
Because of the evaporation of the water during cooking pop corn

75- Plastic is better than wood to make the handle of cooking pots
Because plastic warms slower than wood

76- Due to friction force, the tire of a moving car becomes hot
Because friction force changes kinetic energy into thermal energy

77- A truck is faster than a small car when both of them move down on the same ramp
Because the truck has mass more than the small car, so the truck gains more kinetic energy

78- Smart clothes have many benefits
Because they can control your body temperature, light up in dark and keep themselves clean

79- Properties of plastic are differed from properties of petroleum
Because when chemical change happens, the properties of the new material (plastic) differ from the properties of the original material (petroleum)

80- Scientists should study the structure of molecules of different materials
To understand their chemical structures that help in understanding their properties

What happens

1- If there is much water enters the cell
The cell will swell until it bursts

2- If the cell does not get its needs of nutrients, oxygen, and water
The cell cannot get its needed energy and will die

3- If the number of cells is increased in the body of a baby
The baby will grow

4- If scientists were not invented the microscope
They could not discover more information about the tiny particles and cells

5- If you examine a sample of plant cells using the low power objective lens of microscope
You will see the cells in small size

6- If there are no chloroplasts inside the plant cells
Plant cells cannot make photosynthesis process

7- If selective permeability feature is absent from cell membrane
The cell cannot control the substances that enter or leave the cell
8- If sugar does not reach mitochondria inside the cell
Mitochondria cannot make cellular respiration and cannot provide the cell with its needed energy
9- If the animal cell is surrounded by cell wall
The animal cell will have a definite shape
10- If there are no chloroplasts in plant cells
Plant cells cannot make their own food by photosynthesis process
11- If there are no bones found in the body of the cat
They body of the cat will not have a definite shape
12- If we stain the nucleus of cheek cells with methylene blue
We can see the nucleus of cheek cells as a blue area
13- To the brain of a cyclist when he is exposed to a dangerous situation
The brain sends a signal to the muscles to contract and allow his body to face the danger
14- To your leg if the muscles found in it are damaged
The leg cannot move

15- To the muscles in front of the upper arm and muscles in the back of the upper arm when the forearm moves down away from your shoulder

The muscles in the front of the upper arm relax while the muscles in the back of the upper arm contract

16- To the human body if the cardiac muscles don't contract and relax for a long period of time

The heart cannot pump the blood that carries oxygen to all body cells and the human will die

17- To the human body when the heartbeats increase during danger

The heart pumps more blood to the muscles, the heart and other organs and the blood pressure increases

18- To the lungs when the diaphragm muscle contracts

The lungs take in the air rich in oxygen gas

19- If complex nutrients don't convert into simple substances inside your body

They cannot be used by body cells to get energy and grow

20- If saliva is not secreted during chewing the food inside your mouth

The food cannot be soften and chemical break down will not happen

21- If pancreas and gall bladder don't secrete their enzymes in small intestine

The chemical breakdown of food will not happen

22- If your body does not get rid of waste

The body will get sick

23- If the blood that carries waste materials passes through nephrons of the two kidneys

The blood will be filtered from harmful substances

24- If the blood does not pass through the two kidneys during its circulation inside the human body

The blood will not be filtered from the waste materials and the body will get sick

25- If the pancreas does not make its function correctly

The person will be infected with diabetes disease

26- To the force of gravity if the mass of an object increases

The gravity will increase

27- To the force of gravity if the distance between the object and the Earth's center increases

The gravity will decrease

28- The magnet is approached close to some iron nails mixed with small pieces of paper

The magnet will attract the iron nails, but it will not attract the small pieces of paper

29- If the magnetic objects are placed at a distance and don't locate at the magnetic field of this magnet

They will not be attracted to the magnet

30- If large magnets spin at high speed around the coiled wires

The spinning magnets create electrical charges on the coiled wires and electricity is produced

31- If the electric circuit does not contain a switch

We cannot open or close the circuit

32- If rubber is used in making electric wires instead of copper

The electric current will not flow through the wire

33- If the switch is closed in the electric circuit

The electric circuit will be closed, so the electric current flows through the circuit

34- If a person touches non insulated electric wire through which an electric current pass

He will be shocked with electricity

35- If a large amount of electricity passes through an electric circuit has an electric device and this circuit does not contain a resistor

The electric device will be damaged

36- If electric circuits in houses are connected in series

If one bulb blows out, the others will not work

37- If a magnet is moved rapidly inside a coil of wire in a circuit containing galvanometer

The needle of the galvanometer moves rapidly because of the increase of generated electric current

38- If a patient has a slow or irregular heart beats

An artificial pacemaker is inserted into the chest and stimulates the heart muscle to beat at regular intervals

39- The state of glass when it is heated at very high temperatures
It changes from solid state to liquid state

40- If you hold a piece of frozen chocolate (according to transfer of heat)

Heat transfers from the hand to the chocolate

41- If you touch a hot cup of tea (according to transfer heat)

Heat transfers from the cup to the hand

42- If you heat a piece of butter (according to change of state)

It changes from solid state into liquid state

43- To bridges if engineers do not use expansion joints in their designing

Buckling of bridges occurs as a result of expansion at high temperature

44- To the level of alcohol inside a thermometer if we put it inside hot water

It will rise up

45- The level of alcohol inside a thermometer if we put it inside cold water

It will go down

46- The spaces between molecules of matter if we heat it

It will increase

47- To the size of an inflated ballon if it is put in hot weather

Its size will increase

48- The volume of matter when it is cooled

Volume will decrease

49- If no spaces are left between the railroad tracks

Train accidents occur as a result of bending of tracks in hot weather

50- the molecules' movement of a lizard's skin when it stands on a rock in a sunny day
the molecules of lizard's skin absorb thermal energy that released from the rock, and they will move faster
51- The molecules' movement of a hotter substance after mixing it with a cooler substance
The movement of molecules of the hotter substance becomes slower after mixing
52- the heat transfer, when thermal equilibrium takes place between a hot and a cold object
the heat transfer will stop
53- the kinetic energy of molecules of a matter when it becomes warmer
the kinetic energy will increase
54- the temperature of a piece of metal when you hit it several times with a hammer
the temperature of a piece of metal will increase
55- if you touch a hot metal spoon placed in a hot cup of tea
heat transfers from the spoon to your hand by conduction
56- the mass of a piece of butter after melting it
the mass does not change
57- the stored energy of a stopped object when it goes down on a slide
stored potential energy changes into kinetic energy
58- you are wearing smart clothes in a dark place
they will light up

59- mixing rock, water and sand
concrete is formed

60- making chemical change to some compounds of petroleum
plastic is formed

61- mixing sand, limestone and soda ash at high temperature
glass is formed